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HOOKER'S

JOURNAL OF BOTANY

AND

KEW GARDEN MISCELLANY.

EDITED BY

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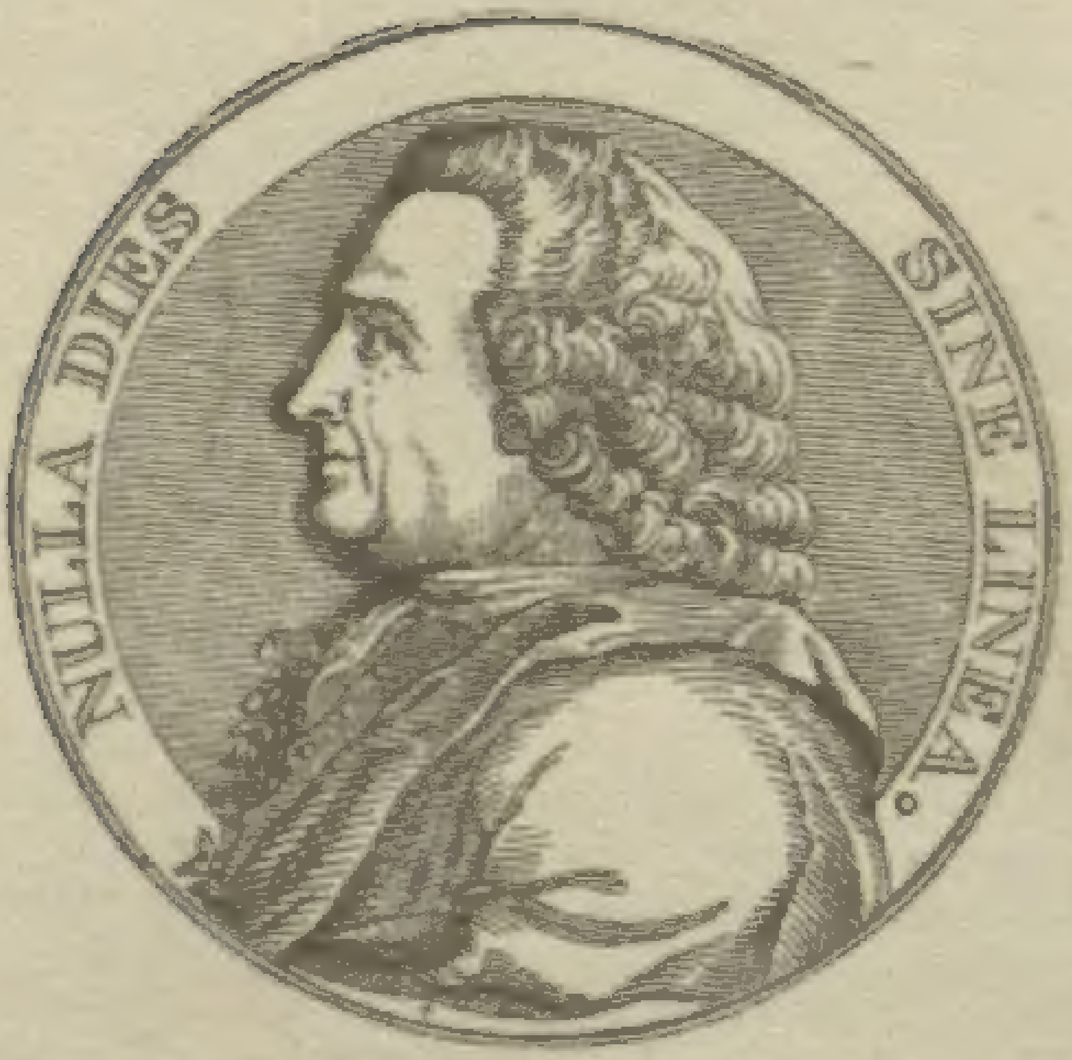

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Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

Calcutta to Darjeeling in Sikkim–Himalayah.*

We left Madras, as you are aware, on the evening of January 9th, and were steaming up one of the outlets of the many-mouthed Ganges (or the Hooghly, as it is called) on Wednesday the 12th. The Deltas of great rivers are always objects of very great interest to travellers, and especially to myself, who had circumnavigated the globe, but previous to our anchoring at Alexandria, never seen one. The estuary of the Ganges is enormous, if compared with the length of that river and its tributaries (except, indeed, the Brahma-putra should prove the Yaru, or, as it is often called, Tsampo of Thibet), and, in this respect, the Nile and Ganges are not to be compared. The former has but few tributaries : none of them rise in very lofty land, or are of snowy origin ; and one only of its great branches carries any detritus, and its course is over rocky strata of excessive hardness for many leagues. The innumerable sources of the Gangetic Delta, again, are all, excepting the Soane, snow-born : its sources are in the drainage, partly of a dry climate (the transnivean sources) where snow accumulates in the

* It should be borne in mind that the information here given is extracted from letters to various friends, written after having passed the plains of India. Particular dates are consequently omitted.

winter; and the main trunk is additionally swelled by the summer rains of the plains. The Ganges thus levies contributions from the precipitated moisture of all seasons in the year, of winter's snows and of periodical summer rains. The courses of its feeders in the Himalayah (which are legionary in number) are along valleys and down hills, whose uniform steepness is without parallel in any mountain-chain, and yet never over precipices: they are consequently most favourably disposed for the collection of detritus, and the effectual transport of this to the main trunks. Hence the enormous sand-banks in the eastern channel of the river, which, shifting along miles of its course after every season of flood, render its navigation the most perilous perhaps of any stream of its size. These vast beds give rise to dust-storms, over which Simooms, in slender pillars several hundred feet high, stalk like moving columns, glistening with the mica, quartz, and hornblende of the far-distant mountains—minerals foreign to the soil of those plains of India on which they are deposited. In the summer, again, the rains of the plains on both banks, rising above the mean level of the soil, discharge their water into the stream, loaded with a fine silt, which forms banks, often alternate with those of the more remotely derived sand, and from its impalpable nature is transported further down, and contributes more directly to the formation of the Delta. The borings in the Sunderbunds, through the various strata, have been carried by the officers of the E.I.C.S. to a great depth and with most interesting results. Such is the origin of the Sunderbunds and green islets along whose palmy banks we steamed our way, now passing little villages or rather congregations of huts, each with its Toddy Palm and patch of cultivation, and again the densest jungle of mangrove and creepers infested with tigers. Occasionally, cleared places exhibited park-like features, with the spreading Banyan, the dusky yellow Tamarind, leafless Cotton-trees and scarlet Terminalias. In the afternoon we were passing Garden-Reach, with the noble Garden-House on the left, succeeded by the river front of the Botanic Gardens itself. Opposite stand the beautiful house, grounds, and gardens of Sir Lawrence Peel, whose walls and trellises were blue with the noble *Ipomœa purpureo-cœrulea*, and the beds scarlet with *Poincettia*. Passing along flat green banks, with superb houses and gay gardens, we left behind us the shady regions of Garden Reach: the country, still jungly on the left, opened on the right, exhibiting the "Course" crowded with gaily-dressed

people, the batteries of Fort William thundering their salutes from beyond, the ships gay with colours, while the gaudy government-boats, all green and gold, with black boatmen in scarlet costumes, inharmoniously splendid, were in readiness to land the Governor-General in the city of Calcutta. This latter is imposing at a distance, superb in some of its details on a close inspection, but, when best appreciated, it exhibits that overgrown splendour in squalor which every city made up one half of huts and the other of palaces must display. Calcutta, as a city, is much overpraised: it has grandeur enough; but except in the Oriental Bazaar and the costumes of the natives, there is not a picturesque feature connected with it—not one street view stops you. The Hooghly, a noble river in itself, is a mere canal amongst architectural features of such dimensions. Chowringhee, a noble road, one side open over a vast green-sward plain to the river and the other a continous line of first-rate English houses, is a fine coup d' œil from the said plain; and the palatial Government-House on the left, and the new Cathedral to the right, are, though far from faultless buildings, noble objects, and, on the whole, good supporters of the frontage; but the ships in the Hooghly rise out of the land and intrude upon the view, whilst Government-House and the Cathedral are each too faulty in proportion to be individually pleasing to the eye. There is nothing in Calcutta to compare with the noble Plazas of Lisbon and many other towns; for those are cities of palaces, where the aggregate of the community unite to raise noble buildings, while here the few dwell in palaces, constructed without reference to the general features of the city. Oxford is a city of colleges: Cambridge has colleges; and however effective the structures of the latter may individually be, they do not, in the aggregate, produce the effect so obvious in the former. So it may be conceded that Calcutta is a city *with* palaces, and plenty of them; but a city *of* palaces is a very different things.

Here you must understand me to be speaking of the city and not of its inhabitants. An Indian welcome is proverbial; and a most cordial one awaited me and was conveyed to me soon after entering the Sunderbund and long before I landed, jointly by Sir Lawrence Peel and by Mr. Colvill, who had each prepared rooms for my reception. The bustle of change at Government-House, made me glad to take advantage of Sir Lawrence's invitation.

During my short stay, of less than a month, at Calcutta, I was fully employed in preparing for an excursion with Mr. Williams of the Geological Survey, who was about to move his camp from the Dummoodah valley coal-fields to Bidjegur on the banks of the Soane. My time was spent partly at Government-House and partly at Sir Lawrence Peel's residence. The former I was kindly invited to consider as my Indian home: an honour which I appreciate the more highly, and which was the more gratifying, because the invitation was accompanied with the assurance that I should have entire freedom to follow my own pursuits, and the advantages which such a position afforded me were, I need not say, of no ordinary kind.

Sir Lawrence Peel's magnificent gardens proved a constant source of pleasure: they are advantageously situated close to the Botanic Gardens, immediately fronting them indeed, with the Hooghly between. Sir Lawrence, you know, is an ardent horticulturist, and his gardens are quite unrivalled amongst the private ones of India: his hospitality, too, is proverbial, and he spared no pains to make me acquainted with all the horticultural peculiarities of India.

At the Botanic Gardens I received every assistance from Dr M'Lelland, who procured drying paper for me and all that I should require for collecting *en route*: he himself was very busy, superintending the publication of poor Griffith's papers and drawings, of which latter the garden artists were preparing copies on lithographic paper. The published parts of the Botanical matter will have reached you before this. What will follow are certainly done from better executed originals, some of them indeed excellent; for Griffith seems to have improved very much latterly. In all cases the artists make accurate copies, the defects, of course, included; and I believe this is the best way to proceed, when it is determined to publish an author's posthumous works complete.

Of the Gardens themselves, it is exceedingly difficult to speak: the changes have been so very great, and from a state with which I had no acquaintance. That there has been a great want of judgment in the alterations that have taken place since Dr. Wallich's time, is most clear.

The best view of the Botanic Garden is from that of my hospitable friend, Sir Lawrence Peel, immediately on the other side of the river. Suppose me now looking across the Hooghly, with as beautiful a river

front as Kew Gardens present *from* Brentford, above the island on the Thames. There is the excellent residence of the Director in view to the extreme left, with one fine *Casuarina* (I think) close by, and thence to the extreme right a wild-looking mass of loose wood skirting the banks, no one tree above half the height of the said *Casuarina*, no vistas, or openings into the ground, none of the better of the existing trees brought into view. Still the extensive piece of ground does contain some fine trees in the back-ground, and, here and there, next the river: and within are four monuments, Roxburgh's, General Kyd's, Jack's, and Griffith's; to all of which open walks should lead. There are two landing-places (Ghauts), one opposite the house, to which there is no balustrade or stone-work, or any avenue from the more distant one conducting to the house. The clearance of late years about the dwelling is terrible, amounting to devastation; and the direction of the new-made walks or roads is unsightly in the extreme. Dr. M'Lelland (in temporary charge of the Gardens) wisely suggests, while the funds are inadequate to keep the whole in order, that some 70 or 80 acres should be devoted to Botanic ground, Palmetum and Arboretum, and the rest be kept as park or pleasure ground. Happily the arrival of the new director, Dr. Falconer, is daily expected. May the palmy days of Roxburgh and Wallich once more return to this ill-fated establishment!

From no one did I receive more kindness than from Mr. Colvill, Advocate-General, and President of the Asiatic Society, who not only took care that I was provided with every comfort, but procured, and liberally presented me with, a completely equipped Palkee, which for strength and excellence of construction, was everything that a traveller could desire. Often have I thanked him since, *en route*, when I have seen other Palkees breaking down, and other travellers bewailing the loss of those forgotten necessaries, with which his kind solicitude furnished me.

With grateful acknowledgment of the kindness of my many friends, I took leave of Calcutta for Mr. Williams' camp.

Hooghly, on the river of that name, was the first stage, and it was performed in a hooded gig, called a Buggy. The road first led through the almost endless suburbs of Calcutta, teeming with population, and the road so choked with native bullock-carts and rude pony-gigs, hackeries, &c., that, smothered with dust as the roads

were, the drive was very uncomfortable. A Fern growing on the walls of the older buildings was the only plant I remarked, and in so dry and dusty an atmosphere it looked sadly out of place. Gradually, at length, the houses became more scattered, the city was left behind, and I entered the Barrackpore * road, lined with trees, chiefly Mango, Pepul, and Banian, Tamarind and *Acacia*, *Melia Azadirachta*, *Odina*, &c. At Futty-Ghaut the river is crossed, and soon after the road runs through Chinsurah, the last of the French settlements in Bengal, where there is a great manufactory of Cheroots. Thence to Hooghly, where I had a letter to the Judge, Mr. Russell (a brother of the late Hon. Wentworth Russell), and from his house I went to Mr. Wauchope's, whither my Palkee had been sent previously. The size and situation of the noble residences of the Civil Service of the Hon. Company are certainly sufficiently striking, and placed, as they most frequently are, in broad lawns, laid out with excellent taste, and commanding, as in this instance, a superb view, they are much more imposing than the Calcutta houses. It was, however, late in the evening when I arrived at Mr. Wauchope's, and I had only light enough to recognise the grand features of a sloping wooded park and the broad river beyond, along whose banks the lights of the boatmen shone like the lamps of some great thoroughfare in Europe.

From Hooghly the road, certainly an excellent one for India, runs north-west to Benares, and is well metalled all the way. Palkee travelling, though commonly described, may bear a notice in a private letter. Its novelty is such that at first you rather like it: the neatness with which everything is packed around you, the good humour of the bearers, their merry pace, and the many more comforts you enjoy than could be expected in a conveyance *horsed by man*, the warmth when you shut the sliding doors, and the breeze when they are open, are all fully appreciated on first starting; but very soon the novelty wears off, and the discomforts are so numerous, that it is, at best, a barbarous mode of conveyance. The greedy cry and gestures of the bearers, when, on changing, they break a fitful sleep by poking a torch in your face and vociferating "Bucksheesh Sahib;" their discontent with the most liberal largesse, ,and the sluggish paces of the next set who want bribes from the inexperienced traveller,

* At Barrackpore is the Governor-General's country-house, a noble building on the banks of the Hooghly.

put you out of patience with the natives. The dust, when the slides are open, and the stifling heat when shut during a tropical shower, are conclusive against the conveyance; and when you get out with aching bones and giddy head at the journey's end, you shake the dust off your whole person, and wish never to see a Palkee again. Then, too, you pass plants and cannot stop to gather them; trees, and don't know what they are; houses, temples, and objects strange to the traveller's eye, and have no one to teach where and what they may be; no fellow-traveller with whom to change one curious remark.

On the morning of January 29th, I was passing through the straggling villages close to Burdwan, native hovels with the Mango and Fig by the road, and Palm slanting over the roof. Crossing the nearly empty bed of the Dummoodah, I was set down at Mr. M'Intosh's, and never more thoroughly enjoyed a hearty welcome and a breakfast.

In the evening we visited the Rajah of Burdwan's palace and gardens, and I had there the first glimpse of oriental gardening: the roads were generally raised, running through Rice fields, now dry and hard. Tanks were the prominent features: chains of them, full, in some cases, of Water Lilies and other aquatic plants, were fringed with rows of the *Borassus*, and occasionally *Phœnix sylvestris*. The trees along the drives were the very common Bengal ones, mentioned above, with the Jack, Bamboos, *Melia*, *Casuarina*, &c. Close to the house was a rather good menagerie, where I saw some old friends, a pair of kangaroos in high health and condition, the mother with young in her pouch, which I had not seen since leaving Australia.

Towards night I was again in the Palkee and hurrying on to Taldangah, near Mungulpur. The night was cool and clear, very different from the damp and foggy atmosphere I had left at Calcutta. On the morning of Jan. 30th I was travelling over a flat and apparently rising country, along an excellent road, with groves of Bamboos and stunted jungly trees on either hand, few villages or Palms, and little cultivation, no large trees, a gravelly sterile soil, with stunted grass, altogether a country as unlike what I had expected on the plains of India, as well might be. To the west were seen conical isolated hills of a 1000 feet or so, and a long low ridge, but to the east and north, and immediately around, all was a dead flat, or table-land; out of which the hills in front rose abruptly, covered with a low forest of dusky green or yellow, from the prevalence of the Bamboo. The lark was singing

merrily at sunrise; and the accessories of a fresh air and dewy grass more reminded me of some moorland in the North of England than of the torrid regions of the East.

At about 10 o'clock at night I arrived at Mr. Williams' camp, and received a most hearty welcome. His operations being finished, he was prepared to start on the following morning, and had kindly waited a couple of days for my arrival.

Early on the morning of the last day of January, a motley group of Hindoos and Mussulmen were busy striking the tents, and loading the bullocks, bullock-carts and elephants: these proceeded on the march, occupying in straggling groups nearly three miles of road, whilst we remained to breakfast with T. Watkins, Esq., the intelligent superintendent of the East India Coal and Coke Company, who are working the seams surveyed by Williams. The jungle I found to consist chiefly of thorny bushes, *Zizyphus?* of two species, an *Acacia* and *Butea frondosa*, the twigs of the latter often covered with lurid red tears of Lac, which is collected here in abundance from this plant. As it occurs on the plants and is collected by the natives it is called Stick-lac, but after preparation Shell-lac. A friend has promised to procure for me the gum in different states of preparation, which, with a few such articles as the red sealing-wax, some native boxes for holding it, picked up at the bazaar, &c., will illustrate this branch of Economic Botany in your museum.

The coal crops out at the surface; but the shafts worked are sunk through thick beds of alluvium which overlie the coal shafts. In the latter those fossils are preserved of which Williams sent so splendid a series to our Museum of Economic Geology, and which were taken from abandoned shafts, to which I could not of course have access. The genera to which the fossils belong are partly English, some Australian, and many peculiar to the Indian coal-field. The English are more allied to those of the oolite formation of that country than to the lower coal; but I am far from supposing that this argues any necessary reference of these Indian beds to the oolite period: the proportion of novelty is far too great. Arguing from analogy, too, we may presume that contemporaneous Floras of two countries so widely apart as India south of the Ganges and England, would be represented by totally different plants; amongst which the presence of the same species, common to both, would be accidental. The oolite fossils of England

are again more closely allied to the existing Floras of that country than are the fossils of the true carboniferous series; whereas, the remains in these Indian seams appear still more unlike any of the plants of the plains I am now traversing, than the oldest coal plants are to the Flora of Europe. It has been supposed that the epoch of the coal formation dates from a period when the areas now covered by coal were islands in the middle of a large ocean, abundance of ferns denoting an insular climate. This theory leads me to insert an observation made on the spot by the Rev. Mr. Everest in 1831, who, in describing the geological features of this country, says,* "it is impossible to see the shale thus full of decayed vegetables, and then to look at the country round—widely different from a regular granite formation, but rather, as it were detached pieces of such a formation, rising out of a sea—it is impossible to see this, and not remember the theory which supposes the first formation of Europe to have been a number of islands of primitive rocks, in the hollows among which were deposited beds, composed of their débris, and subsequently of the vegetables which grew in them, of which theory we here see a beautiful illustration." I had no opportunity of verifying these observations, which I should hardly suppose compatible with the fact that the relative position of the coal-beds here has been altered by frequent faults and upheavals, which would, I should think, destroy any such evidence. Of the extent of the coal-fields in India we have no conception, nor whether these detached ones are portions of others scattered over different parts of the continent, (as is most probable) or not. In respect of extent, depth and number of seams, any comparison with the oolite coals of England is quite out of the question. Williams tells me that in this coal-field alone there are altogether 300 feet in thickness of coal, spread over an area of seventy square miles; and that 17,000 feet intervene between the topmost and lowest seam.

Close by Mr. Watkins' tents a number of women were employed in making gunpowder, grinding the usual materials on a stone, with the addition of water from the Hookah; a custom for which they have an obstinate and unaccountable prejudice, not known in other parts of India. The charcoal here used is of an *Acacia*: the Seiks, I believe, always employ *Justicia Adhatoda*, which is in common use all over

* Gleanings of Science. Calcutta, 1831, p. 133.

India: at Aden the Arabs, I was told, preferred the *Calotropis*, probably because it was most easily procured.

At breakfast I met Mr. Mackenzie, who had served in the "Hecla," during the search after my old commander, Sir James Ross, and his uncle, and who had also been in an Expedition to fix the position of the South Shetlands, when first discovered. Mr. Watkins was long a resident in Assam, and the first agent of the Tea Company there: he assures me that the introduced Chinese plant is exclusively used, and called Assam Tea. Three crops are gathered every year, of which the first is much the best: but the produce of all is mixed together for export. The largest native Assam Tea tree attains a height of forty feet, with a trunk eighteen inches in diameter.

After breakfast Mr. Williams and myself started after the camp to Gyna, twelve miles distant; and I mounted an elephant, for the first time since you lifted me upon one at Wombwell's show, good twenty years ago. The docility of these animals is an old story, but it loses so much in the telling, that their gentleness, obedience, and sagacity seemed as strange to me as if I had never heard or read of these attributes. At the word of command my elephant knelt down, and I crawled or rather clomb up by his hind foot, or ear, and reached a broad pad, or in plain English, a mattress, lashed to his back, holding on by the ropes as he rose, and jogged off at an uncomfortable shuffling pace of four or five miles an hour, and (I took the trouble to count) forty-five paces a minute. The swinging motion, under a hot sun, is very oppressive, but to be so high above the dust is an unspeakable comfort. The Mahout or driver sits cross-legged on the shoulder, and guides him by poking his great toes under either ear, enforcing obedience with an iron goad, with which he hammers the unhappy beast's head with quite as much force as you use to break a cocoa-nut, or drives it through his thick skin down to the quick. A most painful sight it is, to see the blood and yellow fat oozing out in the broiling sun from some dozen holes in his poor skull.

Our elephant was an excellent one, when he did not take obstinate fits, and so docile as to pick up pieces of stone if desired and with a jerk of his trunk throw them over his head for the rider to catch, thus saving the trouble of dismounting. This is geologizing in true Oriental style, and no traveller's tale, I assure yon.

Of sights on the road, unfrequented though this noble line is, there

were plenty for a stranger; chiefly pilgrims to Juggernath, most on foot, and a few in carts or fancy gigs of rude construction. The vehicles from the upper country are distinguished by a far superior build, their horses are caparisoned with jingling bells, and the wheels and other parts bound with brass. Occasionally some rich merchant or Baboo would jolt by, squatted in a gaily ornamented machine, ostentatiously reading a book, and followed by more wives and olive-branches than are quite allowable: more arrows in his quiver than will be blessed.

The kindness of the people for animals, and in some cases for their suffering relations, is very remarkable. A child carrying a bird, kid, or lamb, is not an uncommon sight, and a woman with a dog in her arms still more frequent. Occasionally, too, a groupe will bear an old man to see Juggernath before he dies, or a poor creature with elephantiasis, who hopes to be allowed to hurry himself to his paradise, in preference to lingering in helpless inactivity, and at last crawling up to the second heaven only. The costumes are as various as the religious castes, and the many countries to which the travellers or pilgrims belong, and the various moneys each traveller possesses. Next to the wealthy merchants, the most thriving-looking wanderer is the bearer of Ganges holy water, who drives a profitable trade, his profits increasing as he distances the river, and as his load lightens too. These people carry, generally, two large earthenware jars, one at each end of a bamboo across the shoulder, the jars ornamented with little banners of red rag.

The roads here are all mended with a curious stone, called Kunker, which is a nodular deposit of limestone of unexplained origin, which occurs abundantly imbedded in the alluvial soil of a great part of India. It resembles a coarse large gravel in size, but each pebble is of the size of a wallnut, larger or smaller, and tuberculated on the surface: it binds admirably, and forms excellent roads, but pulverises into a most disagreeable impalpable dust.

Of merchandise we passed very little, the Ganges being still the high road between North West India and Bengal. Occasionally a string of camels was seen, but these are rare, east of the Soane river. A little cotton, clumsily packed in ragged bags, dirty and deteriorating every day, even at this dry season, proves how bad the article must arrive at the market during the rains, when the low waggons are dragged through the now empty streams.

The country is barren all around, the villages only miserable lines of squalid huts straggling along the wood-side, with here and there a far from patriarchal *Ficus* to mark the village tree: the *Borassus* is the only Palm, and it is scarce and scattered.

Strange to say, abundantly as the coal appears at the surface, it has never been, I am told, much used by the natives; no doubt, because wood is abundant. Since the English have worked it, however, the people begin to burn it, though never for cooking.

A few miles beyond Taldangah we passed from over the sandstone, in which the coal lies, to a still more barren country of primary stratified rocks, upon which the former rests; the country still rising, more isolated hills or short ranges appearing, and towering far above all was Paras-Nath, the culminant point of this part of the country, a place whose botany I was most anxious to explore.

At Gyna we found two tents pitched, one Mr. Williams', and the other that of a gentleman attached to the Survey, a third was still another stage a-head with Mr. Hadden, who preceded us to obtain information about the ascent of Paras-Nath.

The botany of this country is very poor, no good-sized trees are to be seen, all is a low stunted jungle, like that described about Taldangah; and though the rock is so different, here gneiss and there sandstone, the prevailing tree vegetation was the same, *Butea*, a *Diospyros*, some *Terminalias?* and *Acacia* being the most frequent; but at this season none were in flower, and few in fruit. The grasses were few and dried up, except in the beds of the rivulets (or nullahs, as I am now accustomed to call them). On the low jungly hills the same plants appear, with a few *Fici*, *Flacourtia*, Bamboo in great abundance, but not large, nor in flower; several *Acanthaceæ*, some handsome; the beautiful yellow *Linum trigynum*, and a few herbaceous *Compositæ*, as *Vicoa Indica*, *Sphæranthus*, *Emilia*, *Blainvillea*, *Conyza*, &c. A few *Asclepiadeæ* climb up the bushes, and the odious *Mucuna*, now with over-ripe pods, by shaking which, as you pass, there often falls such a shower of the cow-itch as to make the skin tingle for an hour: the irritation on a thin skin, was, for a few minutes, intolerable, especially as it generally managed to get up the arm. An *Exacum*, *Erythræa centaurioides*, and a *Canscona*, were not unfrequent herbs.

February 1st.—Started at day-break; we moved on to Gyna, another insignificant village. The air was cool, and the atmosphere clear. The

temperature, at three in the morning, was 65°, with no dew, the grass only 61°. As the sun rose, Paras-Nath appeared against the clear grey sky, in the form of a cone, with a rugged peak, of a deeper grey than the sky. It is a remarkably handsome mountain, sufficiently lofty to be imposing, rising out of an elevated country, the slope of which, upward to the base of the mountain, though imperceptible is really considerable, and surrounded by lesser hills of just sufficient elevation to set it off. The atmosphere, too, of these regions is peculiarly favourable for views: it is very dry; but still the hills are clearly defined, without the harsh outlines so characteristic of a moist air. The skies are clear, the sun powerful; and there is an almost imperceptible haze that seems to soften the landscape, and keep every object in true perspective.*

Our route led over a barren country towards the picturesque hills and valleys in front. The rocks were all hornblende and micaceous schist, cut through by trap-dykes, great crumbling masses (or bosses) of white ungrateful quartz protruded through the soil. The stratified rocks, too, were often exposed, pitched up at various inclinations, sometimes at right angles: they are frequently white with effloresced salts, which entering largely into the composition of the rocks tend to hasten their decomposition, and being obnoxious to vegetation, render the sterile soil more hungry still. There is little cultivation, and that of the most wretched kind; even rice-fields are few and scattered, no corn, grain (*Ervum Lens*), nor Castor oil, no *Poppy*, *Cotton*, or *Carthamus*, or other crops of the richer soils that flank the Ganges and Hooghly; a very little Sugar-cane, Dhal (*Cajana*), Mustard, Lintseed, and Rape, the latter three are cultivated for their oil. Hardly, a Palm is to be seen: the cottages never boast the

* The difference between a clear view in the moist atmosphere of the Himalayah and on the dry plains of India is most remarkable In the former case the *unnatural* clearness and precision of the outline of objects, sixty miles off, is wonderful: the snowy mountains are advanced bodily to within a few miles of the spectator, and the effect is that of looking at a distant object behind one's back in a large mirror. The amazing height and startling forms of the groups of cones, peaks, and jagged crests, the brilliancy and dazzling whiteness of the snow, and the rain-bow hues that reflect from the sinking sun, form, together, a tableau which, to be imagined even, must be seen, and which after being seen, the imagination itself fails to recall. Inconceivably fine as such a prospect is, it is due to an optical illusion, a trick of Nature's, as obviously as is the mirage, or Fata Morgana. Perspective is destroyed, light and shadow abolished; but the spectator is too fascinated to feel the loss of these first elements of beauty in a landscape, and I question whether, if even they existed, the eye would not love best to dwell on the harmonious colouring and true perspective of Paras-Nath on a February morning.

Banana, Tamarind, Orange, Cocoa-nut or Date (*Phœnix sylvestris*). The Mahoua (*Bassia latifolia*), and Mango are the least uncommon trees. There is no Kunker in the soil here, and the roads are consequently mended with quartz, much to the poor elephant's annoyance.

We dismounted where some very micaceous stratified rock cropped out, plentifully powdered with a tasteless saline efflorescence. Three *Zizyphi*, one prostrate, and two erect, prevailed, with the *Carissa Carandas*, now in fruit: its berries are said to make good tarts, and the plant itself forms tolerable hedges. The little *Pterygodium sulcatum* was not uncommon in sandy, dry soils, and resembled our *Neottia spiralis*. On the scattered trees two *Loranthi*, one scarlet and the other pure yellow-flowered, abounded growing on *Acacia* and various other trees, also an epiphytal orchidaceous plant.

Titcoree I found to be 1050 feet above the sea, a much more considerable elevation than I had anticipated. The country around is rather pretty, and hilly, the hills covered with Bamboo and brushwood, and, as usual, rising rather suddenly out of the elevated plains. They afford shelter to a few bears, and still fewer tigers; jackals in abundance, and very rarely foxes; of birds, chiefly pigeons. Insects are very scarce, whether in the air or under stones or bark of trees. *Locustidæ* are the most prevalent, and typical of a dry and sterile climate.

The temperature at 3 A.M., was 65°; at 9 A.M., 77°; at 3 P.M., 82°; and at 10 P.M., 68°, from which there was no great variation during the whole time we spent on these elevated plains. The clouds are rare, and always light and high, except a little fleecy spot of vapour condensed close by the summit of Paras-Nath. The dews have hitherto been very slight, or none at all, though the sky was serene, and the stars clear, which is probably owing to the presence of the same all but imperceptible haze, which, during the day, softens the landscape without obstructing vision.

(*To be continued.*)

Notes and Observations on the Botany, Weather, &c., of the United States, made during a tour in that country in 1846 *and* 1847. *By* Wm. Arnold Bromfield, M.D., F.L.S., &c.

(*Continued from vol.* vii. *page* 384 *of the London Journal of Botany.*)

August 24th.—Visited the beautiful cemetery of Laurel Hill about four miles N.W. of the city on the banks of the Schuylkill, one of the lions of Philadelphia, and much resorted to in the summer season, during which stages (omnibuses) run at short intervals through the day to carry passengers thither. Though not very extensive, the grounds are laid out with taste in walks and shrubbery overlooking the river, towards which it slopes precipitously on that side. A common shrub used to ornament gardens and grounds in this and other parts of America, is the Burning Bush (*Euonymus atropurpureus*) which has acquired its name from the profuse display in autumn, of its large crimson capsules and the scarlet arils of the seed lighting up as it were the broad deep green foliage. It is the American representative of *E. latifolius*, as *E. Americanus* is of *E. verrucosus* of Europe, but is a still larger and handsomer species than the first of these spindle-trees. The second (*E. Americanus*) is often seen in cultivation with our British *E. Europæus*, which thrives extremely well.

Walked from Laurel Hill to Mount Peace, the delightful residence of my kind friend R. Ralston, Esq., whose house was freely open to me by a general invitation from its hospitable and liberal owner, so long as I continued at Philadelphia. In the finely situated grounds were several noble Tulip trees left standing amongst the planted timber, the only now existing denizens of the long since destroyed primæval forest which the axe has spared. Considering the value of the "Yellow Poplar" to the coach-builder and joiner, the escape of these forest veterans, so near a great city, from the saw-mill, is a matter both of wonder and congratulation. The largest Tupelo, Sour, or Black-Gum tree (*Nyssa sylvatica*) I had yet seen, grew on this spot; a beautiful species of a genus as yet hardly known in British aboriculture, though deserving of attention for its wood, which is highly prized by the wheelwright for naves on account of the extreme difficulty with which it splits. The boles of many of the large trees at Mount Peace were clasped in the manner of our Ivy, by the Poison Oak (*Rhus radicans*), which

Mr. R. assured me he dared not handle or even venture to remain standing near for any time; nor were his people willing to undertake the task of clearing it away from the trees, on which it is certainly a graceful climber, so great was their dread of its exhalations. Tall Red-Top (*Tricuspis seslerioides*) was common on the lawns here and in other places in the neighbourhood; a coarse grass growing in tufts, with much the appearance of a *Poa* (*Glyceria Sclerochloa*) in its inflorescence, but with the habit of a broad-leaved *Festuca*. This night and the following morning (25th) were quite fresh and even chilly at Mount Peace, the wind at north-east, which, as is usual here, was the precursor of damp, gloomy, and relaxing weather, with hardly any sun during the next four days, when it cleared, and the two last of the month were fine. The humidity of the air at Philadelphia, lying as the town does betwixt two rivers whose banks are at that part low and marshy, creates languor and oppression in those who come here in summer, and has acquired for it the unenviable reputation of being at that season one of the hottest and closest places in the Union. The truth is, that here, as over the greater part of the United States, the southern ones not always excepted, the houses are as ill adapted for coolness during the intense heats of the American summer as those of London or any other town in England, being, like them, mostly run up slightly, and therefore soon heated through, whilst they possess only the same appliances as our own, of open doors and windows, Venetian blinds, and shutters, and in the hotels, which are perfect ovens from this cause, not always are these two last and cheap appendages to the windows to be found. The substitution of white-wash, or of painted and varnished stucco or stencilling on the walls, in lieu of papering, which is scarcely to be seen anywhere in that country, is doubtless conducive to coolness, but with no provision made for excluding the sun beyond perhaps a flimsy dimity curtain, the evil is only increased by the intolerable glare from the unbroken mass of white which the interior of every room presents, and which in winter has an equally forlorn and comfortless appearance to those accustomed to the warmer colouring and often gay patterns on our papered walls in England.* Most

* I speak now of the hotel or boarding-houses (no inconsiderable fraction of the total number of tenements in American towns) and of their sleeping-rooms which, as in France, are used as sitting apartments, and are the only asylums for retirement from the irksome publicity of the entrance-hall, or of the "gentleman's drawing-room," compared with which, the traveller's room at any of our most frequented

of this coldness of appearance in the rooms might be done away with, were more furniture introduced than is usually to be found even in the houses of the wealthier classes, where we miss many of those objects of taste and luxury rather than of utility, which nevertheless minister in no small degree to the comfort and cheerfulness of our apartments whilst relieving their vacuity.* It is customary here and in the other large towns of the Union, to close the shutters or outside blinds, from an early hour in the morning till late in the afternoon, keeping the rooms nearly in darkness. By this precaution great coolness is secured, but whole streets so shut up convey a melancholy feeling of desertion, as if some fearful visitation had befallen the inhabitants. About sunset every shutter and sash is thrown open for the admission of air, till now so rigidly excluded, and the animated hum of voices succeeds to the death-like stillness of the past day.

August 27th.—Went to Woodlands, formerly the residence of Wm. Hamilton, Esq., a gentleman much devoted to arboriculture, and who formed a collection here of all the American timber-trees he could procure, of which many fine specimens are now standing. The place is situated on the west of the city, and near the Schuylkill, by Gray's ferry, and is at present in progress of being laid out for a public cemetery. The grounds are extensive and finely diversified with gentle risings and groves of stately trees, but, together with the house, are in a neglected state. *Cuphea viscosissima* was abundant in grassy places and in full flower, and *Spiranthes tortilis* grew under the trees in some plenty. This much resembles our *S. autumnalis* and grows in similar places, but is a much taller and slenderer species with a more lax spike, and the root-leaves disappear before the flowers expand. *Tricuspis seslerioides*, *Andropogon nutans* and *A. scoparius*, several species

commercial inns is absolute seclusion. In private residences, more attention is paid to coolness and other essentials to comfort and convenience, which the travelling and boarding public of America seem neither to look for nor require in their not always temporary domiciles.

* This predilection of the Americans for white is universal, and I suspect derived from the Dutch settlers. It is seen in their steam-boats, the hulls and upper works of which are white, and the fitting-up mostly white and gold; in the white and green of their country villas; in the interior of their houses, the walls of which when not dead white, are seldom of any livelier hue than the palest French grey or other neutral tint to be just visible. Their most sumptuous building, the capitol at Washington, is coloured conformably to this national taste, whilst the residence of the chief magistrate of the republic is familiarly known as the "White-House," from the dazzling aspect of its exterior.

of *Panicum*, *Cyperus strigosus*, a *Cardium* (*horridulus*?) *Cassia nictitans*, were amongst the plants observed; whilst in a few places *Convolvulus panduratus* trailed along the ground for many yards together, and now displayed its large white flowers with a purple tube amongst the long grass. Woodlands has the reputation of being, in common with too many of the residences along the Schuylkill, very unhealthy in the latter part of summer and the autumn, which has perhaps been the main cause of the neglect into which the property has fallen, and of its transfer to a Cemetery Company, as less fitted for the abode of the living than as a resting-place for the dead. Many of the villa residences on this river, formerly healthy, have been abandoned of late years from the increasing prevalence of intermittent and bilious remittent fevers, that, like evil genii, haunt its beautifully wooded banks, but to which their malignant agency is happily restricted. The environs of Philadelphia generally, are as free from the above and other sources of disease as those of any town in the United States. The shores of the Delaware, though very low and marshy in places, are said to be healthy at all seasons, but this is a rapid tide-river, much broader and less wooded than the Schuylkill, and consequently with a freer ventilation along its course.

An opinion is afloat, that the insalubrity of the Schuylkill dates from the construction of the stone dam across the stream at the Fair Mount water-works, which, impeding the natural current, has caused a comparative stagnation in the river sufficient to favour the evolution of miasmata. Whether this be the true reason, or whether the aforesaid water-works stand in the responsible position of Tenterden steeple to the Goodwin Sands, certain it is, that not only here, but in many other parts of the country, places formerly habitable with impunity, are now the periodical seat of fever, varying in type according to climate, season, and locality from simple agues to remittents of a dangerous and often fatal character. Of spots thus recently become malarious, I shall have some remarkable cases to notice in the sequel.

The water-works at Fair Mount just now referred to, are for the supply of Philadelphia from the Schuylkill, and are situated by that river on the north-east side of the town. They are well deserving of a visit for the fine view afforded of the city and rich adjacent country from the heights on which the reservoirs are formed, as also for the taste and judgment displayed in the union of architectural embellish-

ment with the every-day purposes of life. The building is a beautiful object from whatever point it is seen; the lower or basement part which is beneath the level of the ground in front, is occupied by the machinery, consisting of some half-dozen powerful water-wheels, giving motion to twice the number of huge force-pumps laid horizontally with very long strokes, and which impel the water into a most capacious reservoir sunk on the eminence which overhangs the structure, and to which there is an ascent by winding walks of easy inclination, bordered by trees and shrubs of various kinds. Amongst these, the Scarlet Trumpet-flower, or, as it is here called, Trumpet Vine (*Tecoma radicans*) indicates by its semispontaneous growth on the rocks, that its appearance in the woods may soon be looked for by the traveller going southward, and accordingly this gorgeous climber greets the eye in a perfectly native state in the neighbourhood of Washington (lat. 38° 53′), which I believe is not the extreme polar limits it attains on meridians to the westward of that city.

Beyond Fair Mount on the line of the Columbia Railroad, the Catalpa (*Catalpa cordifolia*) grows commonly on the sides of hills and steep banks, and though not indigenous to Pennsylvania, is so far naturalized as to look considerably like a native, and ripens abundance of seeds. In America, this tree not only attains a far greater size than is usual with us, but is much more branched, the trunks dividing into more numerous limbs, that are in their turn more minutely ramified. As far as my observation goes, the Catalpa reaches its greatest development in Virginia, where at Richmond (in lat. 37° 34′ W., long. 77° 27′) are specimens on a red sand-stone soil, from fifty to sixty feet in height, and at least four feet in diameter, dividing at no great elevation into vast horizontal limbs forming a round-topped summit of great symmetry and beauty. In both the Carolinas and Georgia it is much diminished in stature, though still a handsome tree, and beyond New York its vegetation is repressed by the rigour of the winter, and its regular proportions much injured by the loss of the end-shoots from the frosts in spring. The native region of this tree has been a matter of question, because it has been frequently remarked growing near old settlements of the Indians. Michaux found it on the banks of rivers in the upper parts of Carolina and Georgia, and I have myself seen it in plenty along those of the Oakmulgee in the latter state, far from houses or cultivation, but always close to the

stream, and not exceeding the dimensions of a slender shrub ten or twelve feet in height. Dr. Bachman tells me it is common along rivers in Virginia, but he does not think it is indigenous there, and observes that where once introduced it speedily establishes itself by the multiplicity of suckers thrown up by the widely-creeping roots.

Sept. 9th.—Started from the pier at the foot of Barclay Street, at 7, A.M., on board the Niagara, New York and Albany steamer, not sorry to exchange my suffocating, though very exalted, quarters under the burning roof of the Astor House, for the cooler atmosphere of the noble Hudson, arriving at Albany, a distance of 151 miles, between 4 and 5, P.M., thus running nearly seventeen miles an hour against the current of the river, including stoppages, which were very numerous.

BOTANICAL INFORMATION.

Mr. SPRUCE'S *intended Voyage to the Amazon River.*

No one can have read the published narrative of a visit to the *Amazon River* by Mr. Edwards (an American gentleman and a descendant, we believe, of the celebrated President, Jonathan Edwards,) without feeling a conviction that there is a glorious field for the botanist, and very much too an unexplored one. Some of the noble tributaries to that river have, indeed, been visited by naturalists, as Burchell (whose collections, we believe, are still in their original packing-cases), Sir Robert Schomburgk, and more recently Mr. Weddell; while Dr. Poeppig has descended almost the whole length of the mighty "Amazon-ström." But, even following their tracks, an ample harvest may yet be gleaned; and a vast deal is virgin territory. Great are the inducements for a botanist to visit these shores, and, influenced by these motives, Mr. Spruce proposes to set out on a voyage thither early in the ensuing spring. His object is partly for his own gratification and information, and the furtherance of the cause of Natural History; and partly that others may share in his collections, either by a subscription paid in advance, to be repaid, according to priority of subscription, in specimens, at the rate of £2. the 100 species, delivered in London, or by purchasing sets at

the same rate after the plants shall have reached England. Mr. Spruce also desires to supply cultivators with seeds and living plants, according to terms hereafter to be agreed upon. We believe few Naturalists have left England better qualified for the task he has undertaken, or better calculated to give satisfaction to the purchasers, than Mr. Spruce, whether in regard to the selection or preservation of his specimens. His beautiful published collections of plants made in the Pyrenees (see his tour given in the London Journal of Botany, vol. v. pp. 345, 417, 431) are a pledge of what may be expected of him from the regions of South America.

Those who desire to address that gentleman on the subject of his collections can do so at Welburn, by Castle Howard, Yorkshire.

Zabucajo, *a new Esculent Nut, recently imported.*

In the Museum of the Royal Gardens, may be seen some nuts or seeds under the name of *Zabucajo.* They were brought to us a few days ago, by our friend Mr. Purdie (lately engaged on a Botanical Mission to New Granada, now in charge of the Botanic Garden, Trinidad) from Edinburgh and Glasgow. His attention was first directed to them at the fruiterers' shops in Edinburgh, where he learned that they were already rather extensively imported from Para to Glasgow and much used at table with the dessert. In size and shape the seeds are not much unlike the so called Brazil-nuts (seeds of *Bertholletia excelsa*), they are equally covered by a hard coat, but are more irregular, and are longitudinally furrowed. This led to a comparison with the fruits of allied plants in the Museum; and it was easy to see that the seeds belonged to a species of *Lecythis*; and all doubts were removed on referring to *Aublet* and finding the identical species described as *Lecythis Zabucajo.* It is there remarked that the seeds are much eaten by the colonists in French Guiana, being sweet and delicate, and considered preferable to the almonds of Europe: an opinion in which we are quite disposed to agree. On account of the excellency of the seeds, the French Government, much to their credit, introduced the cultivation of this Tree into the Mauritius, nearly a century ago, and in 1761, Aublet tells us the plants were then

in a flourishing condition. Happy would it be for our colonies, and for the British West Indian islands in particular, if the introduction and cultivation of useful plants, suited to the respective climates, were, in like manner, encouraged by the British Government.

The entire fruit in question is, like all the *Lecythideæ*, highly curious: it is six inches and more long and about four wide, of a thick and woody texture, opening at the top like a box, with a transverse lid, from the upper side of which lid, a woody column descends to the bottom of the inside of the fruit, and around this column the large seeds are arranged. This and other species of the genus are called in French Guiana *Marmite* (porringer) *de singe*; partly because the monkeys have the good taste to show a fondness for the kernels, and partly from the use made by the negroes of the emptied capsules (the lid being removed), wherewith to entrap these wily animals. The mouth, it will be observed, of the capsule, is narrower than the inside; this being filled with sugar and laid in a place frequented by monkeys, they grasp the sugar and by this means enlarge the paw so as to be unable to extricate it, while their greediness forbids the opening of the paw and loss of the sugar. The heavy fruit of the *Zubucajo* prevents the escape of the animal, who is pursued and taken in this monkey-trap.

PUCHA-PAT, *or Patchouly.*

The history of this favourite oriental scent, the use of which in a fluid form has now extended to Europe, being, we believe, sold in all perfumers' shops, is nevertheless involved in much obscurity. It is true, as has been detailed in our London Journal of Botany, vol. vii. p. 385, that the plant producing it has been described by Professor Tenore under the name of *Pogostemon suavis*, and by M. Sautelet under that of *P. Patchouly*; which latter is adopted by Mr. Bentham in the *Labiatæ* of the recent (twelfth) volume of De Candolle's Prodromus. Yet this author, so learned in the family in question, does not appear ever to have seen a flowering specimen, living or dried; and of its native country he observes, "In hortis colitur ex India orientali? orta;" and again, "Species ulterius comparanda cum *P. parvifloro* et

P. Heyneano." Walpers, indeed, apparently on the authority of M. Pelletier Sautelet, says: "Crescit locis humidis in Insulis Mascarenis;" but if the Mauritius is intended here to be included, we may observe that only one species of *Pogostemon* is described by Bojer as inhabiting that island, *P. paniculatum* of Bentham, and it is merely a garden plant. The method of preparing the extract, or by what people it is prepared, is unknown. Our friend Dr. Wallich, however, has not been inattentive to the subject, as will be seen from the following passage, which he published in the Medical Physical Society of Calcutta, for 1835.

"I shall now advert to another vegetable substance, which, although most extensively used by the natives of this country, has hitherto continued one of the problems in our Indian Materia Medica. The drug to which I allude, is called in Bengalee, as well as in Hindee, *Puchá Pát*, and is found in every bazaar almost throughout Hindustán. My esteemed friend, Baboo Radhakant Deb, now Rajah Radhakant Deb Bahadur, informs me that 'there exists no Sanscrita name for this leaf, which is largely imported by Mogul merchants; that it is used as an ingredient in tobacco for smoking, and for scenting the hair of women, and that the essential oil is in common use among the superior classes of the natives, for imparting the peculiar fragrance of the leaf to clothes.' I believe that the people of the peninsula are peculiarly fond of this perfume, and so are the Roman Catholic inhabitants of this country generally.

"Having ascertained on my return from Europe, two years ago, that a large quantity of what appeared to be the same drug as that commonly sold in the bazaars under the name of Pucha-Pat, had been imported from Penang, I requested Mr. Page Porter, late of that island, and formerly in charge of the botanical establishment there, to favour me with an account of the article, and also if possible with some growing plants of it. In February last year (1834) I had the pleasure to receive from him several plants, which I have succeeded in multiplying by cuttings, and which appear to thrive remarkably well in this garden. Mr. Porter has furnished me with the following memorandum: —'The Pucha Pat grows perfectly wild at Penang, and on the opposite shore of the Malay peninsula, in Wellesley province. The Arabs use and export it more than any other nation. Their annual pilgrimship takes up an immense quantity of the leaf. They employ it principally for stuffing mattrasses and pillows, and assert that it is very efficacious

in preventing contagion and prolonging life. It requires no sort of preparation, being simply gathered, and dried in the sun; too much drying, however, is hurtful, inasmuch as it renders the leaf liable to crumble to dust in packing and stowing on board. In Penang it sells at the rate of a dollar and a quarter to a dollar and a half, per packet. In Bengal, some which was sent from thence several years ago fetched eleven rupees, eight annas per maund. At times the price is much higher. The last investment sold so low as six rupees only per maund. It has not been seen in flower.'

"None of the individual plants in this garden (Calcutta) have hitherto shown any disposition to blossom, owing, perhaps, to the species being so easily multiplied by division. All the green parts, on being rubbed, emit the peculiar smell of the drug sold under the name of Pucha-Pat, which is also very like our shrub, in the form, margins, and surface of the leaves.

"I should have mentioned above, that Baron Hügel informs me that he has found a plant growing wild at Canton, which closely resembles that from Penang, cultivated in this garden.

"Whether *Marrubium odoratissimum Betonicæ folio*, of Burm. Thesaur. Zeyan, p. 153, tab. 71, fig. 1. (*Marrubium Indicum*, n. s. Burman Flor. Ind. p. 127) be our plant or not, it is difficult to say; but it strikes me that that there is at least a considerable affinity between them.

"H. C. Botanic Garden, 6th of June, 1835."

It is further remarked in Dr. O'Shaughnessy's Bengal Dispensary, 1842, p. 93, where the above statement has also appeared :—

"The plant has not to this time (April, 1841) shown any disposition to produce blossoms in the Calcutta garden. Dr. Wallich has been informed by Major Jenkins, the Commissioner in Assam, that a similar plant, probably a different species grows, in the lofty range of hills to the northward of Gowahatti."

I may observe, in conclusion, that a living plant from Professor Tenore has been kindly presented to the Royal Gardens by Mrs. Bentham; but though it is easily increased by cuttings, and the plant flourishes, it has shown no disposition to blossom.

JUTE,—*Fibre of Corchorus capsularis.*

Time was when Hemp and Flax yielded almost, if not altogether, the only vegetable fibre largely manufactured in Great Britain into cloth, cordage, &c. It would be interesting to give a list of the various kinds that are now in use, and still more interesting to speculate on the numerous kinds which may yet be added to that list from various parts of the world, the introduction of which does not appear in any way to diminish the consumption of the original kinds, Hemp and Flax. A few of these we shall at present take occasion to mention.

One compartment of a glazed case in the Botanical Museum is occupied by specimens of an exceedingly long, glossy, Indian fibre, named "*Jute*," together with a very rudely prepared native fabric called *gunny* (rice) *bag*, and other specimens, from the Heathfield factory, at Dundee, to the proprietors of which we are indebted for these samples. They came, accompanied by a note, stating that "ten years ago the use of this fibre was unknown in Europe; but that now it is imported to Great Britain to the pecuniary amount of 300,000*l.* annually!" A dried specimen of the plant itself is placed with the above sample. This was raised in our stove from seeds sent by the same gentlemen, and is the *Corchorus capsularis* of Willdenow; and we shall take an opportunity some day of publishing a figure with further particulars in our Journal. This *Corchorus* has nothing to do with the favourite Japanese yellow-flowered shrub, incorrectly called *Corchorus* in our gardens, (one of the *Rosaceæ*), but belongs to the natural family of *Tiliaceæ*, the various genera and species of which abound in useful fibre, from the gigantic Lime-tree (*Tilia*) to the herbaceous annual here noticed.

CHINESE GRASS CLOTH.

Under this name we have received from Mr. Joseph Woods, Junr., a very beautiful fabric manufactured in China, first imported under the form of handkerchiefs and more lately to a considerable extent, as superior to any other kind of fabric for shirts. By the kind help of Dr. Wallich and Sir George Staunton, we think it may be safely asserted that the "*Chinese Grass*" is the fibre of *Boehmeria nivea*

(*Urtica nivea*, L.) a plant belonging to the Urticaceous (Nettle) family. And here again we see how the same tenacity of fibre exists in the several members of this vegetable groupe, as exhibited in the common stinging Nettle, and still more remarkably in the *Urtica cannabina*, *U. heterophylla*, and another species of *Boehmeria* which we have next to speak of, namely the

POOAH, or *Puya fibre* of Nepal and Sikkim.

For our knowledge and for our possession of specimens of this, we are indebted to Dr. Campbell, the Hon. E. I. C. Political Resident at Darjeeling in Sikkim. That gentleman has kindly presented them, and an interesting pamphlet he has lately published on the subject, to Dr. Hooker, who forwarded them to the Royal Gardens' Museum. Specimens of the plant prove it to be derived from the *Boehmeria Puya*, Wall. Cat. (*Urtica frutescens*, Roxb. not Thunb.), a species botanically very closely allied to the preceding *B. nivea*. It has been long and extensively used in India for various purposes, and when properly dressed is said to be quite equal to the best European flax; while it makes better sail-cloth than any other vegetable fibre produced in India. Rope formed of it has been tested in the Arsenal and Government Dock-yards, and found perfectly equal to any and all purposes for which cordage made of Russian hemp has hitherto been employed. In preparing this fibre, however, the natives unfortunately use mud, which clogs it and renders it difficult to spin, and spoils the colour, as is evident from the sample sent. Mr. William Rownee, superintendent to Capt. A. Thompson (whose report on the quality, &c., of this fibre is quoted by Dr. Campbell), observes, that, if potash were used in the preparation, which is invariably done with Russian hemp and flax, instead of mud or clay, the colour would be improved, the substance rendered easy to dress, and it would not undergo so much waste in manufacturing,

Now, since we can assure these gentlemen that the plant yielding this fibre is a *Boehmeria* (*Urtica* of Linnæus), so closely allied in botanical characters to the "*Chinese Grass*" as to be identical with it, there can be no doubt, that if it underwent the same process of preparation and fabrication as is employed by the very ingenious artificers of the Celestial Empire, the quality would be the same, and it might be made to

compete with their article in the market. Both species are remarkable for the pure snowy white down of the under-side of the leaves, and for the dense clusters of flowers seated upon the stems.

OADAL; *or Fibre of Sterculia villosa.*

The genus *Sterculia* belongs to a family (*Sterculiaceæ*) which, like its near neighbours *Malvaceæ* on the one hand, and *Tiliaceæ* on the other, abounds in tenacious fibre. I mention the "*Oadal*" here, though not possessing any of it at the Museum, because it finds a place in Dr. Campbell's pamphlet above quoted, and because it is now for the first time, so far as I know, brought to the notice of Europeans. This, however, is never manufactured into cloth; its use in India is confined to ropes, which, when well prepared, are equal in strength to the best Coir. The tree is very common in Eastern India, and the rope is readily made; for "the bark, or rather all the layers, can be stripped off from the bottom to the top of the tree with the greatest facility, and *fine pliable* ropes may be obtained from the inner layers of the bark, whilst the outer yields coarse ropes. The rope is very strong and lasting: wet does it little injury. It is the common rope used by all elephant-hunters in the jungles."

FIBRE of *Sterculia guttata*, ROXB.

From the bark of another species of *Sterculia* (*S. guttata*, Roxb.), we may here mention that cloth is made; and the process is thus described in Roxburgh's Flora. "The bark of this tree the Malabars convert into a flaxy substance, of which the natives of the lower coasts of Wynaad contrive to make a sort of clothing. The tree is felled, the branches lopped off, and the trunk cut into pieces of six feet long, a perpendicular incision being made in each piece: the bark is opened and taken off whole, chopped, washed, and dried in the sun. By these means, and without any further process, it becomes fit for the purpose of clothing."

Musa textilis; *Fibre of the Manilla Hemp.*

We again direct attention to this fibre, because of the prevailing error, repeated by almost every one, that the beautiful kind of muslin, called "Manilla handkerchiefs" and "Manilla scarfs," is made of "Pine-apple fibre," (by the term Pine-apple, is here meant plants of the *Bromelia* family,) whereas it is unquestionably made of the far more delicate thread of a species of Banana, common in the Philippine islands, and first clearly defined by Don Luis Nee, in the Annales de Ciencias Naturales, vol. iv. p. 123, as *Musa textilis*. The inner portion of the plant yields, perhaps, the most delicate of all vegetable fibres; and beautiful samples may be seen in the museum, as well as a valuable scarf made from it, presented by Mrs. Bates.

Besides the account of the preparation of this, given in our London Journal of Botany, we may refer to the Annals of Botany by König and Sims, vol. i. p. 200, and p. 551, for further particulars.

NOTICES OF BOOKS.

Dr. Hooker's *Rhododendrons of the Sikkim-Himalaya.*

Messrs. Reeve, Benham and Reeve, have announced the appearance of a work under the above title, in a handsome folio, with descriptions, botanical and geographical, and ten highly finished coloured plates, executed from coloured drawings made on the spot by the author.

The extraordinary success that has attended Dr. Hooker's researches at Darjeeling in Sikkim-Himalaya, in the genus *Rhododendron* alone, suggests the propriety of having the results laid before the public at as early a period as possible. Eleven species rewarded his exertions, of which one was not in a sufficiently good state to make a satisfactory drawing, and another proved to be the *R. arboreum*. One is the rare *R. barbatum*, Don, of which no coloured figure has ever been given; and one is so fine a plant, and of so remarkable a character, that it requires two plates for its illustration :—we mean Dr. Hooker's *R. Dalhousiæ*, an epiphytal species, growing to a height of six feet on the mossy trunks of trees, with beautiful foliage, and bearing flowers, of

which the ordinary size is three inches and a half in length, and three inches and a half in breadth at the mouth, but some have been measured with the corolla four inches and a half long, and four inches and a half broad; these noble flowers are white, tinged with red, and deliciously fragrant.

We are enabled to say that the book will exhibit

Tab. I. Flowering branch of R. Dalhousiæ, *Hook. fil.*: natural size.

Tab. II Reduced representation of an entire plant of the same, growing on the branch of a tree.

Tab. III. R. barbatum, *Don.*

Tab. IV. R. lancifolium, *Hook. fil.*

Tab. V. R. lilacinum, *Hook. fil.*

Tab. VI. R. Campbelliæ, *Hook. fil.*

Tab. VII. R. ovalifolium, *Hook. fil.*

Tab. VIII. R. cinnabarinum, *Hook. fil.*

Tab. IX. R. macrophyllum, *Hook. fil.*

Tab. X. R. Falconeri, *Hook. fil.*

[*For particulars, see advertisement.*]

WALPERS; *Annales Botanices Systematicæ.* Vol. i. Fasc. 1.

Dr. Walpers, having concluded his very useful Repertorium Botanices Systematicæ in six volumes with index, has now the object of giving, we presume from the expression, a *yearly* supplement under the title above quoted. The present is the first fasciculus of the first volume, and it takes in as far as *Celastrineæ* of the new genera and species published in various works since the last supplements of the Repertorium. The value of such a publication is best felt by the working botanist, but we trust it will be duly appreciated by all lovers of plants.

Revue du genre Cinchona, *par* M. H. A. WEDDELL.

The little work bearing this title has reached our hands in the form of a brochure, but, as indicated, it is an extract from the Annales des

Sciences Naturelles for July, 1848; yet we gladly notice it, as giving us the opportunity of announcing that this botanist and traveller is preparing an admirable and elaborate work on *Cinchona*, and the allied genera. His remarkable journey across the whole continent of South America, from Rio de Janeiro to the Pacific, and his residence in the Cinchona countries of Bolivia and Peru, gave him great facilities for studying the medicinal barks *in loco natali*, and the trees producing the respective kinds, of which he has not failed to avail himself; and, as we have seen many of the materials of the work, of which the present article is but the Prodromus, we can safely declare that it will constitute a publication of great value to the botanist as well as pharmacologist. To render his work more complete, Mr. Weddell has visited the Herbaria in England, as well as those on the continent, and thus he will be enabled to clear up many doubtful synonyms. The geographical distribution of the genera and species has occupied much of the author's attention, and his observations on that head will be found peculiarly interesting.

Previous to the voyage in question to South America, Mr. Weddell, after completing his medical education at Paris, devoted much time to an accurate investigation of the Flora of the environs of Paris, the result of which is well known. In 1843 he was attached by the Museum of Natural History of Paris, as physician and botanist to the Scientific Expedition of M. de Castelnau, in 1843. The party proceeded to Rio de Janeiro, thence to the river Tocantins, a tributary of the Amazon, which they descended as far as Fort Barras, where they entered the Araguay, which they ascended, nearly to its source. From this point their course was due west, deviating from time to time according to circumstances, and especially in one direction, southward, to the confines of Paraguay, to Bolivia. They surveyed the vast inland lake of Titicaca, and reached the coast at Arecipa. Mr. Weddell returned to Europe and reached Paris, we believe, during the year 1848. Some of the party subsequently went down the Yavari, and descended the Amazon river, but not without the loss of their baggage, collections, and journals, and what was still more unfortunate, of two of their party, owing to the treachery of their guides.

According to Mr. Weddell, in the Revue here noticed, the genus *Cinchona*, of Linn., is divided into five genera; viz., 1. *Cinchona*; of which he enumerates twenty-one species, giving characters of the

new ones (they are eleven); 2. *Cascarilla*, Wed., twenty-one species (of which eight are new); 3. *Remijia*, eleven species; 4. *Gomphosia*, Wed., two species (one is new); 5. *Ladenbergia* of Klotzsch, (one species).

FLORA HERTFORDIENSIS; *being a Catalogue of Plants of the County of Hertford, with the stations of the rarer species; by the* Rev. R. H. WEBB, Rector of Essendon, Herts., assisted by the Rev. W. H. COLEMAN. London. 1848. Part I. 12mo.

This is one of the few books which contains more than it promises. It is far from a mere catalogue of the plants of the county. It has the great merit of noting these plants according to geographical distribution; and at the very outset of the little volume, we have a neat map of Hertfordshire, showing the districts into which it is proposed to divide the county for the illustration of its botanical geography. The introduction treats of the physical geography and botanical divisions of the county, and is from the pen of the Rev. W. H. Coleman: it is well worth a careful perusal, and cannot fail to gratify all who take any interest in the botany and geology of Hertfordshire. The catalogue in the first number includes *Ranunculaceæ*. No specific characters are given, but full habitats, enumerating the districts. There is a copious table of Desiderata, showing the districts in which each plant named is wanting.

MOORE'S *British Ferns*. 12mo. London. 1848.

We have here a "Hand-book of British Ferns, intended as a guide and companion in Fern culture." Mr. Thomas Moore, its author, is well known as a successful cultivator of plants, and of Ferns in particular, of which he has been a no less successful student; so that he possesses great advantages in the preparation of such a work. The substance of what is contained in this little book, the preface tells us, has already appeared, in detached portions, in a periodical publication, (Gardener's and Farmer's Journal). "In their present form,

the original papers, which were not intended for separate publication, have undergone revision; and wood engravings of all the species, and principal varieties treated of, have been added." The whole is highly creditable to Mr. Moore; and we can confidently recommend it to the lover, and especially to the cultivator, of this beautiful tribe.

De Candolle; *Prodromus Systematis Naturalis Regni Vegetabilis.* Tom. xii. Paris, 8vo. 1848.

Every botanist will rejoice at the appearance of this, the twelfth volume of the Prodromus of De Candolle. It commences with the *Selaginaceæ* (by Choisy). 2. We have the *Labiatæ* (by Bentham), containing very many additions to the previous work of Mr. Bentham on the same Order. 3. *Stilbaceæ* (by Alphouse De Candolle). 4. *Globulariaceæ* (Alph. De Candolle), and 5. *Plumbagineæ* (by Boissier). Such names are a pledge to the value of the volume.

The second part of the thirteenth volume, we are informed on the wrapper, containing *Phytolaccaceæ* by M. Moquin-Tandon, and *Nyctaginaceæ* by M. Choisy, is in the press, and will appear in April, 1849. The first part of the thirteenth volume, containing *Solanaceæ* and *Plantagineæ*, will be afterwards published.

Port Natal Herbarium.

A very good collection of dried specimens of Port Natal Plants, formed by a German Naturalist, and consisting, we speak at a venture, and only upon a slight inspection, of perhaps 150 species, has been received, and are offered for sale, by Mr. Clark of St. Pancras Lane, Cheapside, London. We are glad to know that he has placed them in the hands of Mr. Heward (Young Street, Kensington) for distribution at the rate of £2. the hundred, all expences included. We can confidently recommend them to all botanists who desire to form an herbarium of that remote corner of the globe.

On the Awns *of* Nepaul Barley (*Hordeum cœleste*, vars. *trifurcatum* and *ægiceras*), *by the* Rev. J. S. Henslow, M.A., *Prof. of Botany in the University of Cambridge.*

In the London Botanical Journal, vol. vi. p. 216, Sir Wm. Hooker has noticed the "Thibetian Barley," a variety of *Hordeum cœleste*, and has there stated it to be my intention to send him a notice of the peculiar structure of the awns in another sub-variety of the same race, known by the name of Nepaul Barley. Last autumn (1847) I was comparing a few ears of this curious Barley, received from Miss Molesworth, with the account and figure given of it by Seringe in his Céréales Européenes, and observed some facts which he had not noticed. The appearances before me seemed to encourage the idea that the monstrous condition of the awns was owing to an effort made by the plant to develope, upon them, three of the associated single-flowered spikelets characteristic of this genus. The singularity of such development was also increased by the glume-like scales of these presumed spikelets occupying a reversed, or inverted position; whilst the awn itself was often terminated abruptly, or was much distorted, beyond the spot from which they originated. On mentioning this to Sir Wm. Hooker, he showed me a drawing he had made of an awn of this Barley several years ago, in which were represented the same glume-like scales, developed as in some of the specimens I had been examining.

I waited till I should possess a better opportunity of following up this investigation upon fresh specimens, which I hoped to raise from the seeds of those ears I had examined. In plants grown in my own garden during this summer (1848) I readily detected both stamens and pistils, in a rudimentary state, among the glume-like scales upon the awns. But I have had a still better opportunity afforded me, by plants grown in the Kew Gardens, of tracing the phenomenon to its true cause. I have made drawings of many of the numerous forms which the awns presented, and (on Plates II. and III.) I have arranged a selection from them in a sequence that will serve to illustrate the idea I have formed of the cause which has operated in producing this singular monstrosity. In Plate II. fig. 1, 2, 3, are represented (of about the natural size) a few of the more prominent differences which the awns assume in the three associated spikelets of the inflorescence of this kind of

Barley. In fig. 1, the awn of the central spikelet is much dilated, whilst those of the lateral spikelets are entirely wanting. In fig. 2, the awn of the central spikelet becomes distorted at the spot where the two lateral expansions (which I shall call wings) originate. One of the lateral spikelets has the awn somewhat shortened, and this is without any lateral expansion; in the other, the awn is entirely abortive beyond the base of the wings, which gives to the apex of the palea a hastate character. This is the appearance frequently assumed by the awns of all the spikelets, and has given rise to the name "trifurcatum," (*Seringe*, Pl. V.) in a sub-variety. In fig. 3, the apices of the wings of the awn of the central spikelet are remarkably extended into long awn-like processes, and have here assumed a forward direction, whilst their margins have united so as to form a kind of *cucullus* about the summit, whilst the awn itself is abortive. In a figure (but without description) given by Royle in his Plants of the Himalayah mountains, all the awns are thus represented; and this condition constitutes (I believe) the sub-variety "*ægiceras*." In one of the lateral spikelets (in fig. 3) the awn is completely abortive, though the wings are partially developed, and in the other, the awn is reflexed from its base, whilst glume-like scales are developed from the apex.

Numerous as are the modifications in form assumed by the awns, I have met with no example which could not be explained upon the supposition of its having resulted from an effort, more or less distinctly manifested, to produce one or more adventitious buds from the axis of the awn itself. To illustrate this opinion more readily than by description, I have placed the four letters *x*, *a*, *b*, *w*, at corresponding points in the specimens represented in Pl. II. and III. Thus:—

x, marks the position of the apex of the awn.
a, the base of the adventitious bud.
b, the "basial" leaf of the bud (to be presently explained).
w, the "wings" or lateral expansions of the awn.

The simplest modification presented by an awn consists of a slight degree of flexure in the midrib or axis, as at fig. 4 (*a*). This is seen as in fig. 5, 6, to be owing to an effort of the awn to throw off a bud at the point where the flexure occurs, and this bud is at first distinctly noticeable under the form of a mamillary mass of cellular tissue. At fig. 7, 8, side and back views (much enlarged) are given of this bud in

its most rudimentary state. Its base lies towards the apex of the awn, whilst its axis is (in this example) so much inclined as to be nearly parallel to the axis of the awn. Between the cellular mass of which the bud is formed and the awn, is a thick rudimentary scale (*b*) which I shall name the "basial leaf" of the bud; and it will be seen, that the mass of the bud adheres to it, except at its apex. This "basial leaf" is invested with succulent hairs at the back and margin, and a few such hairs are also seen on the cellular mass of the bud itself. That the axis of this bud is not primarily or essentially so much inclined to the axis of the awn as in this instance, appears to be shown by the specimens figured at 9, 10, 11, where it has developed under the form of a sub-cylindrical column, but does not exhibit any very distinct traces of separation, or subdivision, into organized appendages of any kind. A transverse section of this columnar mass shows it to be composed of cellular tissue, within which green matter is deposited throughout the space running a short distance within and concentric with the surface. In these instances the axis of the bud is perpendicular, or very nearly so, to the axis of the awn. But where the two axes are much inclined to each other, this has been owing (as it seems to me) to the base of the bud having been carried a little forward, subsequently to its development, by the extension of the awn.

The position of the apex of the basial leaf may here be observed marked out by a few hairs at the base of the column towards the side nearest the base of the awn. All the further modifications which I am about to describe appear to have resulted from the relative degree of influence that has been exerted between the developing forces respectively employed in extending the awn and the bud, wherever the axis of the latter has become more or less inclined to that of the former. If I may be allowed the use of the expression, "axis of development," to signify any axis whatever round which, and in relation to which, organized tissues have formed or are forming, we shall here have two such "axes of development" (that of the awn, and that of the bud) which become more or less inclined to each other, though normally at right angles. The results produced by the forces which collect and arrange the materials round these two axes respectively will therefore interfere, and we may expect to see a vast variety of external

modification in the combinations to be effected between their interlacing or engrafting tissues. One influence which the presence of the bud appears to exert upon the awn, is more or less to check its development, so that its apex (*x*) is often brought down close to the base of the bud, fig. 11, 17, &c., sometimes it is altogether abortive beyond it, fig. 13, &c. But the influence which produces the most marked character in the awns of this barley, is that which extends the tissue lying between the base of the bud and the apex of the awn into the form of the lateral wings already noticed, fig. 11, &c (*w*). The direction of the apices of these wings, their structure, and the position of the hair on their margins, clearly indicate their formation to bear some degree of relation to the bud whose basial leaf is developing in an opposite direction to the awn. Crowded together as any of the appendages which the bud may produce would often be, and closely connected with the wings, we may anticipate various degrees of fusion to take place between contiguous parts. The foliaceous expansions, which in some examples may be freely developed, would in others be so combined by their margins or by their surfaces, as to present the condition of a "gamo-membranous" expansion. Thus, at fig. 14, 16, where the axis of the awn has not become abortive beyond the base of the bud, the margins of the wings have united, and become strongly developed. The developing forces, which are now acting in nearly opposite directions, cause the awn itself to recurve, whilst a cucullate form is also given to the extremity. Where the apex of the awn is but little or not at all extended beyond the base of the bud, but the wings do not combine at the edges, they are spread out laterally, and the appearance is merely hastate (fig. 22).

In fig. 15 the cucullate expansion has been removed, and we recognise the position of the developing bud at the place where the awn has taken a marked curvature. In fig. 17, 18, 19, the base of the bud has been carried forward with the developing awn, to which the basial leaf has adhered throughout by its back, its apex alone being more or less free. Indeed, this basial leaf is often represented by no more than a depression along the middle of the awn, with hair upon its margins, fig. 22. Here I may notice an important indication of the extent to which the tissue formed in relation to the axis of the bud has interfered with that which is in relation to the axis of the awn. This is shown by the direction of the hairs on the back of the awns! Under

ordinary circumstances these hairs are directed forward, but in many instances (fig. 17, 18) they become reflexed throughout the space immediately beneath the base of the bud (*a*) and the spot where the basial leaf (*b*) ceases to be attached to the awn. This is a pretty constant phenomenon wherever the bud has become well developed; and it appears very clearly to indicate the great extent to which the forces in relation to its own "axis of development" have exerted their influence over parts which otherwise would have been modified by those forces only which are in relation to the "axis of development" of the awn.

Among the examples just given, we have (at fig. 19) very distinct traces of the formation of several rudimentary appendages round the axis of the bud. A rudimentary scale, stamen, and ovaries, fig. 20, are well marked, and indicate the fact that the bud is strictly floral in its character, and is composed of several internodes. We may now readily anticipate the occasional exhibition of a still more complete development of floral appendages upon it, and such are often found to be numerous and well marked. The scales are often more or less membranous and closely resemble the ordinary glumæ and paleæ of regularly formed spikelets. Those which belong exclusively to the bud are easily distinguishable from the "wings," which we have considered to result from some joint influence of both axes of development. In fig. 23 is represented the most highly developed state I have noticed of the stamens. In this case, distinct traces of pollen occurred, though the grains did not contain granules. Some of the stamens were free and well formed, but others were coherent and associated, as in the three at fig. 24.

At fig. 26 is an appearance, more than once noticed among the appendages, of a delicate membrane with rudimentary stamens and pistils, which had been coiled up in a spiral manner. The stamens and pistils are bent back in the figure, but *in situ* were erect and parallel to the axis of the coil. The membrane appears to be composed of rudimentary scales, cohering by their margins; or may we not rather say, that this membrane would have subdivided into such scales, if the developing process had proceeded to perfection? At fig. 27 are forms exhibited by imperfectly organized stamens, and at fig. 28 by pistils, produced on the buds.

Other modifications of the developing appendages to the bud are

represented at fig. 21, 25, &c.; and as the same letters always indicate similar parts, I need not dilate on them. In cases where the influence producing the bud appears greatly to have exceeded that which has extended the awn, the apices of the wings are directed forwards, and often run out in the form of two long lateral awns, fig. 29. Their margins sometimes becoming adherent to the appendages of the bud, the cucullus partakes more of the character of these appendages, and is highly membranous, with little or no pubescence, fig. 29, 30. Some modification of these conditions causes the apex of the awn to become reflexed, as we see in fig. 31 to 35, where the wings (partaking of a highly membranous character), and the strongly reversed direction of the pubescence on the back, indicate the superior influence of the bud over that of the awn. At fig. 34, the awn seems to have recovered (as it were) its influence, and to have run out to some extent beyond the base of the bud, but in fig. 35, it has been stopped abruptly, whilst the middle scale of three which have been developed at the base of the bud, has run out to a considerable length, and terminates in a very distinct awn. But these modifications are endless.

Having observed how strong an influence the bud produces upon the tissue which strictly forms a part of the awn, both by extending it laterally into "wings," and by causing the hair on the back of it to take a reflexed direction, it was no surprise to find examples upon which the developing axis of the bud had exerted a still greater influence upon the back of the awn than upon the front; and had caused the cucullus formed by the wings to assume a reversed or dorsal position. Fig. 36 is the front, and fig. 37 the back of an awn thus modified, whilst fig. 38 has the reversed cucullus removed. We here find the apex of the "basial" leaf rather more distant than usual from the wings, and scarcely any further traces of the bud on the upper surface. But on the back, the base of the bud is distinctly marked by the protrusion of a mamillary mass of cellular tissue, and its apex appears also to be determined by the protrusion of another such mass a little below the place where the basial leaf (on the opposite side of the awn, fig. 36) is attached. The midrib of the awn is unusually thickened, and the hair upon it strongly reflexed. Here the developing axes of the awn and bud appear most completely blended, but are still exerting their respective influences in diametrically opposite directions.

More than one effort to develop a bud may be noticed on some awns, as at fig. 39 to 43. In that which is nearest the base I retain the same letters, to denote the parts developed. Thus the depression marked (*b*) in fig. 59, indicates the position of the basial leaf, and the wings are reduced to small expansion (*w*) : whilst the same letters with a dash over them (`), indicate analogous parts, in another bud somewhat higher on the awn. This second effort is generally slight, and the parts are developed in a confused manner, though some of them are often sufficiently distinct to be recognised. The change of direction in the pubescence (or else its partial absence) on the back of the awn, indicates the limits within which the respective influences of the separate buds are restricted. Fig. 42 is an inner view of the scale marked (*à*) in fig. 41, showing its tendency to form a distinct awn. Fig. 44 is the upper portion of fig. 43 somewhat enlarged.

Although these buds are most frequently formed on the inner surface, I have met with one example, fig. 45, where it was evident a depression (*b*`) on the margin of the awn, was due to the imperfect development of a second basial leaf; and thus there seems to be good reason for supposing that buds might be developed all round the awn.

Raspail (Ann. des Sc. tom. iv. p. 277) has shown that the mid-ribs of both upper and lower paleæ are capable of becoming detached under the form of floriferous axes ; so that we may regard an imparinerved palea as a foliaceous expansion adhering to a developing axis. But it seems to be further possible to consider any of the nerves to be capable of assuming this same character, from an observation I made upon an inner palea of one of the lateral spikelets. It is represented, cut in halves, at fig. 48, with two paleæ at the back attached to the mid-nerve, and another to a lateral nerve. Another remarkable monstrosity presented the appearance at fig. 47, where the axis had become branched, and thus had produced two apices, on each of which a bud was developed, whilst on only one of these the wings had become definitely extended. I have also figured (fig. 46) an appearance of one of the paleæ (in a lateral spikelet), which had produced an awn by the development of a nerve placed laterally with respect to the middle of the awn. As the mid-nerve is here wanting, I presume it has united with one of the lateral nerves, and that the usual amount of parenchyma between them has not been formed.

The inferences which seem to arise from the result of these observations, may possibly tend to throw light upon the conditions under which unsymmetrical flowers have originated. Thus, in the well-known Pelorial form of an Antirrhinum, where there is a return to regularity, we may suppose the subordinate "axes of development," if we may thus consider the several vascular bundles which proceed to the separate parts of the flowers, are here symmetrically arranged round the main axis. Every departure from such symmetry in the position of these axes would introduce irregularity in the combinations between the separate parts to which they give rise, and thus one-fifth, two-fifths, &c., of the flower might become irregular in consequence. By the partial separation or branching of a main axis, supporting single flowers whose parts may happen to be normally some multiple of either three or five, a sort of "macle" flower (to borrow a term from crystallography) might result, in which the parts should be arranged in fours, &c. Among many examples I have specimens of *Fritillaria Meleagris* in which the peduncles have branched, and so bear either two or three separate flowers; and, in some cases, these branches are so combined that two flowers have more or less coalesced, and the result has been a "macle" flower with two pistils, but fewer than a double number of stamens or segments of the perianths. May not some such condition be the more ordinary state of certain flowers, as those of *Paris quadrifolia*; or even of the flowers of certain groups, as in *Cruciferæ*? The chief objection to such a view appears to lie in the different angular intervals at which similar parts would now be arranged round the main axis. But possibly some readjustment would here take place, just as we find to be the case in flowers whose parts are variable.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

Continued from p. 14.

Calcutta to Darjeeling in Sikkim-Himalayah.

Feb. 2nd.—The sun rose this morning behind a heavy bank of clouds, which gradually ascending expanded into a mottled cirrho-cumulus, covering the whole sky. It was probably owing to a north-easter (the moist wind of this quarter) bringing vapours, which are condensed over the mass of hills in front, the latter being cooled during the night. At 6 a.m., we started for the next station on the road (Tofe choncy), the hills increasing in height as we proceeded, and the country becoming more picturesque, though not less barren. We passed some tanks covered with abundance of white Egrets and *Villarsia* (*cristata*?). The situation of the Bungalow (for the convenience of Palkee travellers) is very pretty, at the foot of the hills which cluster round the base of Paras-Nath, the mountain itself rising upon the left, clothed with forest to its craggy top. The elevation of this station I find to be 1,128 feet.

There are a good many tanks at the base of the hills here: their existence so near a lofty mountain from whose sides watercourses innumerable descend, indicates the great natural dryness of the country during one season of the year. Two species of *Clusia* abounded, with a *Potamogeton* and *Utricularia*, besides *Mazus*, *Lindenbergia*, and a few dwarf *Leguminosæ* on the banks. The hills and valleys are richer than I expected, though far from luxuriant. A fine *Nauclea* (*cordifolia*) is a common tree; a small *Bignonia*, leafless, but with an immense pod hanging awkwardly from the branches, and a handsome *Combretum*, with white and red floral leaves, abound; also *Conocarpus latifolius*, and a large-leaved *Smilax*, and *Dioscorea*. Of Ferns there were the withered remains of none but *Lygodium*, *Cheilanthes* (silvery underneath), *Adiantum*, and *Selaginella*, with abundance of *Marsilea* and *Azolla* in wet places. Ascending a granite hill, Bamboo was still the prevalent plant, probably *B. stricta*, but no flower seen; this has foliage green when young and fresh, yellow in age, and white in decay, so as to show in itself a great variety of tint. *Acanthaceæ* are the prevalent Natural Order, they are gay-flowered *Ruellias*, *Barlerias*, and such like, sometimes large shrubs: *Bauhinia* (*scandens* or *racemosa*) is very frequent,

and an erect smaller species. The hill-top was rocky with blocks of granite, covered with scattered trees, and a few foliaceous Lichens, as *Parmelia perlata*, which latter I had nowhere seen on the plain below. A yellow crustaceous Lichen always affected the shaded rocks; it is a degenerate state of one of the *parietina* section of *Parmelia*, a plant whose different states find, I am convinced, a local habitation and a name in several genera.

Other plants gathered here, and very typical of the flora of this dry region, are *Linum trigynum*, *Feronia Elephantum*, *Ægle Marmelos*, *Helicteres Asoca*, *Abrus precatorius*, *Flemingia*, various *Desmodia*, *Rhynchosiæ*, *Glycine*, and *Grislea tomentosa*, very abundant, *Conocarpus latifolius*, *Loranthus longiflorus*, and another species; *Exacum tetragonum*, *Erythræa centaurioides*, *Canscora pusilla*, *Phyllanthus Emblica*, various *Convolvuli*, *Argyreia* and *Ipomæa* and *Evolvulus*, *Cuscata*, and several herbaceous *Compositæ*, as *Sphæranthus*, *Emilia*, *Conyza*, *Wollastonia*, *Vicoa Indica*, *Blainvillea*, &c.

Feb. 3rd.—At 3 A.M., the temperature was 55°, very cold to the feelings; and though the sky was clear, the night calm, and the temperature of the grass only 46°, no dew had collected, owing doubtless to the haze which, though of extreme tenuity, was perceptible on the horizon.

At 6 A.M., started (for the ascent of Paras-Nath) to a small village at the north base of the mountain, or opposite side from that on which the road runs. Following the latter for a few miles, I observed some cotton cultivated on the sides of a hill, so steep that it was difficult to imagine how the soil could be retained: it was a warm south exposure, and the only cotton I had seen anywhere on these plains. Leaving the road, we took a path through beautifully wooded plains, with scattered trees of the Mahoua (*Bassia latifolia*), much resembling good Oaks.* *Buchanania latifolia* is here an abundant and handsome little tree, in full flower. *Kydia calycina* forms a large bush. *Bombax heptaphylla* started boldly out from the other forest-trees. A *Lagerstræmia* is not uncommon. *Fici*, *Gmelina arborea*, *parviflora* and *Asiatica*; *Diospyros*, two species; *Bauhinias*, *Nauclea cordifolia* and *parvifolia*; *Anacardium*, *Semecarpus*, *Terminalias*, and clumps of Bamboo. The

* The natives distil a kind of arrack from the flowers, which are also eaten raw. The seeds, too, yield a concrete oil, by expression, used for lamps, and occasionally to fry withal.

under-shrubs are of the previously mentioned species, with a handsome *Clerodendron*, and little or no herbaceous growth, except a wiry *Andropogon*, *Anthistiria*, *Saccharum*, &c.

At the foot of the mountain some villages were passed in warmer localities, and on a more fertile soil than those near the road we had left. Talipot-Palms and Mangos flourished, with extensive Rice-fields and broad acres of Mustard, Flax, and Rape; in the latter the *Orobanche Indica* abounded, pushing its blue flowers through the soil. The distance to Mudderbund we had understood to be six miles off the road, but now found that this short cut lay through ravines, too narrow for the elephants. We therefore wound round by wooded valleys and sometimes the beds of streams, and did not reach the village till 2 P.M. All the hill-people hereabouts are a fine athletic race, far superior in looks and knit of limb to the low-country Bengalees: they disclaim all knowledge of tigers, which are the dread of the Palkee-bearers along the road at the foot of these hills, who affirm that the very torch-bearers are seized by these animals at night, and eaten, torch and all, as children swallow apple-candles lighted with almond wicks.

The site of Mudderbund, in a clearance of the forest, is charming, and the appearance of the snow-white domes and bannerets of its temples through the fine trees by which it is surrounded, is highly attractive. Though several hundred feet above any point hitherto reached, the situation is so sheltered that the Tamarind trees, Peepul, and Banyan are superb. Of the latter a most noble specimen stands at the entrance to the village, not a broad-headed tree as is usual in the prime of its existence, but a mass of trunks, throwing out minute branches very irregularly in a most picturesque manner. The original trunk was apparently gone, and the principal mass of root-stems is fenced in. This, with two magnificent Tamarinds, forms a grand clump. The ascent is at once from this village by a good path, worn by many a pilgrim from the most distant parts of India.

Paras-Nath is a mountain of peculiar sanctity, to which the flourishing state of Mudderbund is to be attributed. The name is that of the twenty-third incarnation of Jinna (*Sanskrit*, Conqueror), who was born at Benares, lived 100 years, and was buried on this mountain, which is the strong-hold of these people in Eastern India, as Mount Abo is in Western (where are their libraries and most splendid temples). The origin of the Jains sect is obscure, though their rise appears to

correspond with the wreck of Buddhism throughout India, in the 11th century. They are, in some sort, a transition sect between Buddhists and Hindoos, differing from the former in acknowledging castes, and from both in their worship of Paras-Nath's foot, instead of that of Munja-gosha of the Boodhs, or Vishnu's of the Hindoos. As a sect of Boodhists their religion is generally considered purer and free from the obscenities so conspicuous in Hindoo worship; whilst, in fact, it is perhaps more theoretically unchaste; but the symbols are fewer, and indeed almost confined to the feet of Paras-Nath, and the priests jealously conceal their erotic doctrines.

The temples are, though small, well built, and carefully kept. No persuasion could induce the Brahmins * to allow us to proceed beyond the vestibule without taking off our shoes, a mark of homage to which we would not consent. The bazaar was large for so small a village, and crowded to excess with natives of all castes, colours, and provinces of India, very many from the extreme W. and N.W., Rajpootana, the Madras Presidency, and Central India. Numbers had come in good buggies, well attended, and appeared men of wealth and consequence; while the quantities of conveyances of all sorts standing about, rather reminded me of an election, or of a Chiswick fête, than anything I had ever seen in India.

The natives of the place were a more Negro-looking race than the Bengalees to whom I had previously been accustomed; and the curiosity and astonishment they displayed at seeing (probably very many of them for the first time) a party of Englishmen, was sufficiently amusing. Our coolies with provisions not having come up, and it being 2 o'clock in the day, I having had no breakfast, and being ignorant of the exclusively Jain population of the village, sent my servant to the bazaar, for some fowls and eggs; but he was mobbed for asking for these articles, and parched rice, beaten flat, with some coarse sugar, were all we could obtain; together with a kind of sweetmeat, so odiously flavoured with various herbs, and sullied with such impurities, that we quickly made it over to the elephants.

Not being able to ascend the mountain and return to-day, Mr. Williams and his party returned to the road, leaving Mr. Haddon and myself, who took up our quarters under a noble Tamarind-tree.

* Jains allow Brahmins to officiate in their temples.

Though Mudderbund is elevated and well wooded, its vegetation is not rich. Grasses and *Cyperaceæ* are all burnt up; there are no mosses on the trees, and very few Lichens on the rocks. The latter consist of hornblende, schist, and gneiss tossed up at all angles round the base of the mountain, which is granitic, and has probably been upheaved through the surrounding beds.

In the evening a very gaudy Poojah was performed. The car, filled with idols, was covered with gilding and silk, and drawn by noble bulls, festooned and garlanded. A procession was formed in front; and it opened into a kind of arena, up and down which gaily dressed dancing-boys paced or danced, shaking castanets, the attendant worshippers singing in discordant voices, beating tom-toms, cymbals, &c. Images (of Boodh apparently) abounded on the car, in front of which a child was placed. The throng of natives was very great and perfectly orderly, indeed, sufficiently apathetic: they were remarkably civil in explaining what they understood of their own worship.

At 2 P.M., the thermometer was only 65°, though the day was fine, a strong haze obstructing the sun's rays; at 6 P.M., 58°; at 9 P.M., 56°, and the grass cooled to 49°. Still there was no dew, though the night was starlight.

Feb. 4th.—At 2 A.M., temperature 54°, grass 48°. At ½ past 6 A.M., having provided Doolies, or little bamboo chairs slung on four men's shoulders, in which I put my papers and boxes, we commenced the ascent. At first we passed through woods of the common trees, with large clumps of Bamboo, over slaty rocks of gneiss, much inclined and sloping away from the mountain. The view from a ridge about 500 feet high, was superb. We saw the village, its white domes buried in the forest below, which continued in view for many miles to the northward. Descending to a valley, some Ferns occurred, and a more luxuriant vegetation, especially of *Urticeæ*; by a rivulet wild Bananas formed a beautiful, and, to me, novel feature in a native wood. I took for granted they were planted; but I have since heard that the Banana grows wild in the Rajmahal hills (N.E. of this and of which these mountains are a continuation), and no doubt here also. A white-flowered Rubiaceous plant (*Hamiltonia suaveolens*) was very abundant and handsome, with a few *Compositæ*, many *Acanthaceæ* and *Leguminosæ*, but no mosses, and few tree-Lichens or *Fungi*. The conical hills of the white ants are very abundant. The structure ap-

pears to me not an independent one, but the débris of clumps of Bamboo, or large trees which these insects have destroyed. As they work up a tree from the ground, they coat the bark with particles of soil glued together, carrying upwards as they go this artificial sheath to the bark. A clump of Bamboos is thus speedily killed; the culms fall away, leaving the myriads of stumps coated with sand, which the weather soon fashions into a cone of earthy matter.

Ascending again, the path strikes up the hill through thick forest of *Val* (*Vatica robusta*) and other trees, spanned with cables of scandent *Bauhinia* stems. At about 3,000 feet above the sea, the vegetation becomes more luxuriant, and by a little stream I collected five species of Ferns, some Mosses, and *Hepaticæ*, all in a poor state, however. *Ficus artocarpifolia* (?) with its hanging tufts of naked root-like twigs from the limbs, was plentifully covered with fruit. *Aristolochia*, (sp.?) abundant, some *Smilaceæ*, *Clematis*, a terrestrial Orchidaceous plant, and *Disporum* and *Roxburghia viridiflora*. Still ascending, an increased number of Grasses and *Cyperaceæ* are seen; but the *Hamiltonia* ceases, and is succeeded by other bushes of *Verbenaceæ* and *Compositæ*. The white ant apparently does not enter this damper region.

On ascending to 4,000 feet, the vegetation again changes; the trees all become gnarled, stunted, and scattered; and as the steepness also increased, we soon emerged from the forest. This was at the foot of the great ridge of rocky peaks, stretching about east and west for three or four miles. Abundance of a species of Barberry marked most decidedly the change in the vegetation, and was frequent over the whole summit, mixed with coarse Grasses, *Cyperaceæ*, and bushes.

At noon we reached the saddle of the crest, where stood a small temple, one of five or six which occupy various prominences of the ridge. The wind blew N.W., and cold to the feel, the temperature 56°. The view was beautiful, but the atmosphere too hazy; to the north, rose ranges of low wooded hills, and we saw the course of the Barracker and Adje rivers; to the south, lay a flatter country, with lower ranges, and the Dummoodah river, its all-but waterless bed snowy white from the exposed granite rocks with which it strews its course. East and west I saw several sharp ridges of the mountain itself, the western considerably the highest, and each crowned with a white temple. Immediately below, the flanks appear clothed with impenetrable forest, occasionally inter-

rupted by rocky eminences; while to the north the grand trunk-road shoots across the plains, like a white thread, straight as an arrow, spanning here and there the beds of the mountain torrents, with the pretty bridges erected by my friend Lieut. Beadle.

On the south side the vegetation was more luxuriant than on the north, though from the heat of the sun, the opposite might be expected. This is owing partly to the curve taken by the ridge being open to the south, and partly that the south winds are the damp ones. Accordingly, plants which I had left 3,000 feet below on the north side, never ascended to near the summit, such as *Fici*, *Bananas*, and various weeds. A small short-stemmed *Phœnix* was tolerably abundant (probably *P. Ouseleyana*, Griff.), and a small tree of *Pterospermum*, on which a species of grass grew epiphytally, but too withered for me to determine: it formed a curious feature.

The situation of the principal temple is superb, below the saddle in a hollow facing the south, surrounded by forests and the Banana and Banyan. It is small, but handsome, and contains little inside to remark but the sculptured feet of Paras-Nath, and some slabs of marble with Boodh idols, cross-legged figures with crisp hair, and the Brahminical cord. These, and a leper covered with ashes in the vestibule, and an officiating priest, were all we saw within.

The number of pilgrims on various parts of the mountain was very considerable, passing from one temple to another, and leaving generally a few grains of dry rice at each: the rich and lame were carried in doolies, the poorer people walked.

The culminant rocks are very dry, but during the rains they may exhibit many curious things; a fine *Kalanchoe* was common, with the Barberry, a beautiful *Indigofera*, and various other shrubs; a *Bolbophyllum* I saw, but out of reach, and the withered remains of a *Begonia*, *Selaginella*, and some other Ferns. *Oncophorus* (?) was the prevailing moss. There were no birds, and very few insects, a pretty *Pontia* being the only butterfly. The striped squirrel was busy among the rocks, and I saw a few mice and the traces of bears.

At 3 P.M., the temperature was 55°, and the climate deliciously cool and pleasant. I tried to reach the western peak perhaps three hundred feet above the saddle, by keeping along the ridge, but was cut off by precipices, and ere I could return, it was time to descend. This I was glad to do in a doolie, and borne on four coolies' backs, I

was carried to the bottom, with only one short rest, in three-quarters of an hour. The descent was very steep the whole way, partly *down literal stairs* of sharp rock, where one of the men cut his foot severely. The pathway at the bottom was lined for nearly a quarter of a mile with the sick, halt, maimed, lame, blind, awaiting our descent. It was truly a dreadful sight, especially the lepers and numerous unhappy beings, victims to elephantiasis.

Interesting as the botany of Paras-Nath proved, its elevation did not produce such a vegetation as might be expected, if the extraordinary amount of influence exerted by the dry climate and barren soil be left out of the question. A tropical growth advanced to the summit; and in some respects, as the increased proportion of Ferns, additional Epiphytal Orchideous plants, *Begonias*, and other species showed, its top indicated a more tropical flora than its base. On no part of the mountain grew any Palms (except the starveling *Phœnix*), nor were Tree-Ferns, *Aroideæ* (*Potthos*), Peppers (the Betel is only a *reputed* native of the hill), *Menispermaceæ*, *Guttiferæ*, *Vitis*, *Laurineæ* or *Scitamineæ* observed. All of these groups abound on the humid faces of the sub-Himalaya, in the same longitude and only three degrees further north, and are there, at 4,000 feet, succeeded by *Rubi*, Oaks, and the plants of a temperate region, none of which latter, or any other genus, except *Berberis*, *Thalictrums* and *Clematis*, and *Disporum*, indicated at the summit of Paras-Nath any approach to the flora of the temperate zones.

In the evening we withdrew again to our Tamarind tree, and on the following morning regained the grand trunk-road, taking up our quarters at the Dawk Bungalow of Doomree. On the way I found the *Cæsalpinia paniculata* (?) festooning the trees, a magnificent climber with deep green leaves and gorgeous racemes of orange blossoms. Receding from the mountain, the country again became barren, *Acacia* and *Zizyphi* prevailing. At Doomree (alt. 1,176 feet) the hills were of stratified primary rock with a great deal of quartz, and no Palms, or large trees of any kind appeared. The spear-grass abounds, and a detestable nuisance it is, its long awns and husked seed working through trowsers and stockings, till one's limbs look as if stuck full of black pins. *Balanites* was not uncommon, forming a low thorny bush, with *Ægle Marmelos* and *Feronia Elephantum*. Having rested the tired elephant, we pushed on in the evening to the next stage, Baghodur, arriving there at 3 A.M.

Feb. 6th.—I started at 6 A.M., walking to Lieut. Beadle's (Surveyor of Roads) bungalow, sixteen miles on the same road. The country round Baghodur is as barren as Doomree; but it gradually improves to the westward, where the ground becomes very hilly, the road winding through pretty valleys. *Nauclea cordifolia* is common, and resembles a young Sycamore. Crossing some well-bridged beds of rivers, the road rises a good deal, and measures at the highest point 1629 feet above the sea. The *Bombax*, now leafless, is not uncommon, and very striking from its buttressed trunk, and gaudy scarlet flowers, swarming with chattering birds, which feed upon the honied blossoms.

At 10 o'clock, the sun became uncomfortably hot, the thermometer being only 77°, but the black bulb therm. 137°. I had lost my hat, and possessed no substitute but a silken nightcap; so I had to tie a handkerchief over my head, to the astonishment of the passers-by, who probably never saw a white man walking in the sun along the grand trunk-road before. Holding my head down, I had little source of amusement but reading the foot-marks on the road; and these were strangely diversified to an English eye. The elephant, camel, buffalo and bullock, horse, ass, pony, dog, goat, sheep and kid, lizard, wild-cat, and pigeon, with men, women, and children's feet, naked and shod, were all recognisable.

The valleys seem to favour a better vegetation, though the soil is as barren as hitherto; for I passed a little Sugar-Cane and Banana; but with these rare exceptions the Bamboo alone betrayed the Indian soil.

It was noon ere I arrived at Lieut. Beadle's, glad enough of the hearty welcome I received, being very hot, dusty, and hungry. The elephant, I should have told you, was tired and foot-sore, so I had left him at Baghodur for Mr. Haddon, who remained behind to bring up the strolling carts, which awaited at Doomree our return from Paras-Nath.

The country about Beadle's bungalow is very pretty, from the number of wooded hills and large trees, especially of Banyan and Peepul, noble oak-like Mahoua (*Bassia*), *Nauclea*, Mango, and *Ficus infectoria*. These are all scattered, however, and do not form forest, such as in a stunted form clothes the hills, and consists of *Diospyros*, *Terminalia*, *Gmelina*, *Nauclea parvifolia*, *Buchanania*, &c. The rocks are still hornblende, schist, and granite, with a covering of alluvium, full of quartz pebbles. Effloresced salts are frequent on the exposed rocks, and

probably render them unfavourable to Lichens, for these, though common, hardly ever assume the foliaceous form. Insects and birds are more numerous, with jays, crows, doves, sparrows, and Maina (*Pastor*); also the *Phænicophaus tristis* (Mahoka of the natives), a walking cuckoo, with a voice like that of its English name-sake, late in the season. It is a bird, which, though of frequent occurrence, is rarely seen.—Height above the sea, 1339 feet.

In the evening visited the hot springs, situated close to the road. Such springs are abundant in the earlier rocks of India, from the plains of Thibet almost to Cape Comorin, and at all elevations. These springs, four in number, rise in as many little ruined brick tanks, about two yards across. Another tank is fed by a cold spring, about twice that size, which flows between two of the hot ones, only two or three paces distant from the latter on either side. All run through the primitive rocks, meet in one stream after a few yards, and are conducted to a cold-water tank, about eighty yards distant, by bricked canals. The temperatures of the hot springs were, respectively, 169°, 170°, 173°, and 190°; that of the cold 84°, at 4 P.M., and 75° at 7 A.M., of the following morning; the hottest is the middle of the five. The water of the cold spring is sweet, but not good, and emits gaseous bubbles: it is covered with a green floating *Conferva*. Of the four last, the most copious is about three feet deep; it bubbles livelily, its heat boils eggs: the water though brilliantly clear, has an intolerably nauseous taste. This and the other warm ones deposit salts in a very concrete state on the brinks and surrounding rocks.

Confervæ abound in the warm streams from the springs: two species, one ochreous-brown, and the other green, occur on the margins of the tanks themselves, and in the hottest water, the brown being the best Salamander, and forming a belt within the green: both appear in broad luxuriant strata where the water is cooled down to 168°, and below, to 90°. Of flowering plants, three showed in an eminent degree a constitution capable of resisting, if not a predilection for, the heat. These were exclusively *Cyperaceæ*, a *Cyperus*, and *Eleocharis* (?) having their roots in water of 100°, and where they are probably exposed to a greater heat, and a *Fuirena* (?) at 98°, all very luxuriant.

From the edges of the four hot springs I gathered sixteen species of flowering-plants (*Desmodium*, *Oldenlandia*, three *Compositæ*, *Boerhaavia*, two *Gramineæ*, *Panicum*, *Eragrostis*, and eight *Cyperaceæ*), and from

the cold spring four (a *Composita*, a large species of *Boerhaavia*, *Emilia*, and *Acanthaceæ*), which did not occur in the hot.

A water-beetle, *Colymbetes* (?), and *Notonecta* abounded in water at 112°, with quantities of dead shells, very active frogs, and live shells, at 90°, with various water-beetles. I regret having no means of detecting the salts of these waters; but I bottled some for future analysis.

The situation of these springs (called Sooroochkund) is remarkably pretty, near the mouth of a valley. They are objects of worship, of course; and a ruined temple is seen close behind, with three very conspicuous trees, a white thick-stemmed and armed, leafless *Sterculia*, whose ramuli bore dense clusters of greenish-red, fetid, and viscid flowers, a Peepul and a Banyan.

On the following day, I botanized in the neighbourhood, with poor success: an oblique-leaved *Ficus* climbs the other species, and generally strangles them. Two other Epiphytal *Orchideæ* occur on the trees, besides the one alluded to, an *Angræcum* and an *Oberonia*. *Cuscutæ*, of two species, swarm over and conceal the bushes with their yellow filaments, especially choking the *Vitex Negundo* (?). *Mucuna* is a common and most disagreeable companion, the *cow-itch* of its pods flying about with the wind, and causing intolerable irritation.

I send you a sketch of the smoking springs, to remind you of Iceland, done by my friend Beadle, who is a capital artist; also of Paras-Nath, and of the *Cholera tree*, for so a famous Peepul by the road is called, which I passed the following day; it is covered with inscriptions, and votive tokens, in the shape of rags, &c. Beadle is kindly making studies of the best trees in the neighbourhood for you, the Banyan, Mahoua, Peepul, and *Sterculia*: he has a charming port-folio of Indian sketches, amongst which his pretty bridges and surrounding scenery along the road form a prominent feature.

Feb. 8th.—Left Lieutenant Beadle's early this morning, following Williams' camp. The morning was clear and cold, the temp. only 56°; we crossed the nearly empty broad bed of the Burkutta river, a noble stream during the rains, carrying along huge boulders of granite and gneiss. Still ascending, I measured the highest part of the road, 1691 ft., and suddenly came upon a small forest of a peculiar-looking tree, quite new to me. This proved to be the Indian *Olibanum* (*Boswellia thurifera*) conspicuous for its pale bark, and patent curving branches, leafy

at their apices: its general appearance is a good deal that of the mountain-ash; and the leaves, now copiously falling, and red in decay, are similarly pinnated; they actually reddened the ground. The Gum was flowing abundantly from the trunk, very fragrant, clean, and transparent. Many of the trees were cut down, and had pushed leafy ramuli in great abundance from their stumps. The ground was dry, sterile, and rocky, with little other vegetation: *Orchideæ* or *Loranthi* grew on the trees, and but little grass under foot. Kunkar, the curious formation I told you of before, re-appears in the alluvium. Another *Phœnix* occurred here, similar to, but, I think, distinct from, the Paras-Nath species, probably *P. acaulis* (Griff.): it is wholly stemless, and I saw male flowers only.

Suddenly descending to the village of Burshoot, we lost sight of the *Boswellia*, and came upon a magnificent tope of Mango, Banyan, and Peepul, so far superior to anything hitherto met with, that we were glad to have hit upon such a pleasant halting-place for breakfast. There are a few lofty *Borassi* here too, great rarities in this soil and elevation: one, about eighty feet high, towered above some wretched hovels, displaying the curious proportions of this tribe of Palms: first a short cone, tapering to one-third the height of the stem, the trunk then swells to two-thirds and again tapers to the crown.

Beyond this, to Burree, the country ascends, and is tolerably wooded, but otherwise sterile and unproductive. Burree (1619 feet) is another dawk bungalow, a barren place, which we left at day-light on the morning of Feb. 9th.

So little was there to observe, that I again amused myself with watching foot-steps, the precision of which in the sandy soil was curious. Looking down from the elephant, I was amused to see them all in *relief*, instead of *depressed*, the slanting rays of the Eastern sun in front producing this kind of mirage: the effect was highly curious. We crossed another shoulder of a hill on this undulating road, at an elevation of 1524 feet, and descended to the broad stony bed of the Burrackur river, an affluent of the Dummoodah, and therefore of the Hooghly. Except some cotton cultivation, there was little to be seen; and before us rose no more of those wooded hills that had been our companions for the last 120 miles, and whose absence is a sign of the nearly approaching termination of the great hilly plateau which we had traversed for that distance.

Chuparun, the next halt, is situated on an extended barren flat, 1526 feet above the sea, and from it, the drop from the table-land to the plains below is very sudden.

Feb. 10th.—At day-light, left Chuparun and descended the Ghat, or Dunwah pass, as it is called, to the great valley of the Soane, and to the level a little above that of the Ganges at Patna. The road, though very steep, is admirably carried zigzag down a broken precipice of gneiss, with a fall of nearly 1,000 feet in six miles, of which 600 are exceedingly rugged and steep. The pass is well wooded with small trees; amongst them the *Boswellia* is conspicuous, now pushing its flowers from the leafless apices of the branches. Quartz and felspar are the prevalent minerals, and barren enough in every respect, except supporting this low ragged wood and abundance of Bamboo. *Bombax*, *Cassia*, *Acacia*, and *Butea* are likewise frequent, as is a *Calotropis*, the purple Mudar (much used for leprosy in India), a very handsome road-side plant, which I had not seen before, but which, with the *Argemone Mexicana*, was to be a constant companion for hundreds of miles farther. All the views in the pass are highly picturesque, though wanting in good foliage, such as *Ficus* would afford, of which I did not see one tree. Indeed, the absence of the genus (except *F. infectoria*) in the dry woods of the plains I traversed, is very remarkable. The Banyan and Peepul appear (as the Tamarind, Mango, and Mahoua?) but always planted.

Dunwah, at the foot of the pass, is 817 feet above the sea, and nearly 1,000 feet below the mean level of the high land I had quitted. Everything bears here a brighter aspect; the woods at the foot of the hills afforded better botanizing, and the Bamboo (*B. stricta* ?) is green, instead of yellow or white. A little castor-oil is cultivated, and the *Phœnix sylvestris* (poor and stunted) appears about the cottages.

I was amused with my servant here having a chillum, or earthen bowl to his hookah, but no cocoa-nut bowl on the stem, fashioning the latter out of two petioles of *Ricinus* in a way I can only explain by a sketch.

In the woods I heard and saw the wild peacock for the first time. It is not to be distinguished from the tame bird in England,—a curious instance of the perpetuation of character under widely different circumstances.

In the evening left Dunwah for Bahra, the next stage, passing over

very barren soil, covered with low jungle, the original woods being apparently cut for fuel. Our elephant, a timid animal, came on a drove of camels in the dark by the road-side, and in his alarm insisted on *doing battle*, tearing through the thorny jungle, regardless of the Mahout, and still more of me: the uproar raised by the camel-drivers was ridiculous, and the danger to my barometer imminent.

Feb. 11th.—Left Bahra at day-light for Sheegotty, where Mr. Williams and his camp were waiting our arrival. Wherever cultivation existed the crops were luxuriant, but generally the soil was very barren, yielding only about half a dozen species, to any ten square yards of ground. These were *Olax scandens*, two *Zizyphi*, *Acacia Catechu* (?) and *Carissa Carandas*, the *Olax* climbing over the other bushes. The climate, however, was warmer, and certainly moister, for I observed dew for the first time this morning. The above plants were characteristic of the bad soil: the good was very richly cultivated with Poppy (I had not seen it before) Sugar-cane, Wheat, Barley, Mustard, Rape, and Flax. At a distance a field of Poppies looks like a green lake, studded with white water-lilies. The houses, too, are better and have tiled roofs. In such situations, the road is lined with trees of *Borassus*, *Ficus*, *Phœnix*, and *Acacia*, *Bombax*, *Melia*, *Sapindus*, and Mango. Another wilderness intervenes before reaching Sheegotty, the largest town since leaving Burdwan, and where we arrived at noon.

A review of the ground gone over is assuredly unsatisfactory in a botanical light, except in showing how potent are the effects of a dry climate and soil upon vegetation. At another season, very many more species of plants might be obtained; but during the rains the jungles of Bahar and Birhoon, though far from tropically luxuriant, are singularly unhealthy.

In a geographical point of view, the range is of great interest, as being the north-east portion of the chain that crosses the peninsula from the gulf of Cambay to the junction of the Ganges and Hoogly, a Rajmahal. This range runs south of the Soane, and further west south of the Nerbudda river, dividing the valley of that river from the Taptee. The Rajmahal hills have generally been considered the north-east termination of the Vindhya; but I can show this opinion to be erroneous, the latter range bounding the Nerbudda and Soane on the north, running parallel to this, and terminating on the Ganges at Chunar. The two ranges are, also, especially at their eastern division,

of a totally different character: this is of gneiss and granite, in much inclined beds, with bold mountains, as Paras-Nath, rising 3,000 feet above its mean level; while the Kyman or north-east continuation, on the other hand, consists of level beds of sandstone, averaging a similar mean height, but with no eminences. The ascent to the range I have traversed from Burdwan is gradual; over the coal strata which rest upon it, a few miles beyond which it attains its average height, which is continued for upwards of a hundred miles, to the Dunwah pass, in short, where the descent is sudden to the level of the flat stoneless plains of the Ganges. These extend up either bank of the Soane, and one must travel eighty miles over them, before reaching the Vindhya.

There are two culminant points in this range, Paras-Nath and the range of Mainpath, about fifty miles west of Paras-Nath. All the rivers which rise in this, the great water-shed of this part of India, flow either north-west into the Soane, as the Rhern, the Kunher, and the Coyle, or a few insignificant streams find their way north into the Ganges. More considerable ones flow east into the Hoogly, as the Dammoodah, with its affluents the Adje, the Dalkisore, the Burrackur and Cossai; whilst from its south and south-east face the Sabunrika, the Brahminy, the north branches of the Mahanuddy which flow into the bay of Bengal are derived.

Hence, though difficult to define from its broken outline, from its gradual slope to the east, and from the impracticable nature of its southern boundary, it is a feature of peculiar interest: from its elevation it is the source of all the rivers I have enumerated; while from its position, it is the director of the course of the Soane and of the Ganges above Rajmahal. In its climate and botany it differs equally from the Gangetic plains to the north, and the hot, damp, and exuberant Teak forests to the south. Its geological features are equally marked, as are its products, whether natural or of agriculture, and its native population. Lastly, it performs the same important part in the country bounded by the Hoogly, Ganges, and Soane, that the Khasya hills do in Assam and the Bundelkund to the westward.

Still further west, and centrally in regard to India, this vast granitic plateau rises probably yet higher, and meeting the Vindhya at Omer-kuntuk, the two form the lofty land where the great rivers of Central India have their source: the Soane flowing into the Ganges, the Nerbudda and Taptee into the gulf of Cambay, the Cane into the

Jumna, and the northern feeders of the Godavery into the bay of Bengal. Further west, the two great chains again separate: the Vindhya, as I said before, running along the north bank of the Nerbudda to its *débouche*: the prolongation of the southern or Paras-Nath range, continuing parallel with the Vindhya on the opposite or south bank of the river, and called the Satpura hills. Chota Nagpore, near Main-path, is one of the most remarkable places on this range, near which Col. Ouseley, the Commissioner, has magnificent gardens, of which you may have heard, upon the hills; and there the descent to the hot, low, and pre-eminently tropical Teak jungles of Orissa is as sudden as is that at the Dunwah pass to the Gangetic plains.

Feb. 12th.—Left Sheegotty at sunrise, crossing some small streams, affluents of the Ganges. Long ranges of low hills here rise suddenly out of the plains: they are of volcanic rocks, greenstone and syenite, apparently forcing up the beds of quartz and gneiss from below, which are exceedingly hard and dry, covered with the vegetation of the sterile soils. They were formerly used for the chain of telegraphic posts, communicating, I believe, from Calcutta to Benares. We halted at Nuddurpur. I sunk a thermometer three feet four inches in the soil, which maintained a constant temperature of 71° 5′, that of the air varying from 77° 5′ at 3 P.M., to 62° at day-light the following morning, when we moved on to Nourungabad.

The road being highly cultivated, and the *Phœnix* becoming more abundant, we encamped in a grove of these trees. All are curiously distorted, from the yearly cuts made to tap them for toddy. The incision is just below the crown, and slopes upwards and inwards: a vessel is hung below the wound, and the juice conducted into it by a little piece of Bamboo. The trunks grow all zigzag, from the practice of cutting alternately their opposite sides. This operation spoils the fruit, which, though eaten, is small, and much inferior to the African Date.

Botanized along the course of a stream, and found many plants of the low plains of India, unknown on the hilly regions. *Calotropis* and *Argemone* were immensely abundant, with a purple *Solanum* (*S. Indicum*), *Veronica Anagallis*, *Equisetum*, a brilliant Gentianeous plant, (*Exacum tetragonum*,) and a small *Potentilla*, *Trichodesma Indica*, various *Scrophularineæ*, *Boragineæ*, *Labiatæ*, and other annuals, the analogues of English corn-field weeds, were all much withered and past flower.

BOTANICAL INFORMATION.

Major Madden *on the Botany, &c., of the Turaee and Outer Mountains of* Kumaoon.

It is delightful to mark the rapid progress now making in our knowledge of Indian botany, particularly in the northern and elevated regions, throughout, we may say, the whole chain of the Himalaya, a mountain range, forming, as it were, the boundary line between India proper and the vast table land of Thibet, and extending from longitude 75° to 96° east, and in latitude from 28° to 35° north, covering an extent of 1,600 miles, and including the loftiest mountains of the world. The first great impulse was given by Drs. Wallich, Royle, and Falconer, and Mr. Griffith; and we have lately been gratified by an inspection of a portion of a very fine collection made during the extended travels of Capt. Munro, 39th Inf., in various parts of this range and from considerable elevations. Mr. Edgeworth is still devoting much time to the botany of this country. At the present moment we are happy to be able to speak of three journeys of great interest, undertaken at three widely different points, and which cannot fail to add immensely to our knowledge of the vegetation, and the geographical distribution of species and genera, of that region. First, that conducted by Dr. Thomas Thomson; second, that of Dr. Hooker, the one at the western, the other almost at the eastern extremity of the range; and thirdly, that of Major Madden, Bengal Artillery, in a country almost exactly at equal distances from the two, namely "Turaee and the outer mountains of Kumaoon," between the Kosilla and the Thalee rivers. Notes on the two former of these journeys are commenced, and will be continued, in the pages of our periodical. It is now our agreeable duty to mention that of Major Madden, briefly, however; and nothing more is necessary, for happily his own account is published in the Journal of the Asiatic Society, for 1848: the first part, all that we have yet seen, in the May number.

This portion occupies 100 pages of chiefly botanical matter, and comprises the result of observations made during several excursions from Almorah to the mountains in question, performed in the cold season or spring. During, and after, the rainy seasons, when vegeta-

tion is most luxuriant, the climate is unfortunately so unhealthy as to preclude anything beyond the most rapid transit. The routes, however, are the more interesting from including a tract of country intervening between those districts explored by Drs. Wallich and Royle.

First stage, Almorah to Munjerd, eighteen miles. The Kosilla river flows through a very deep and impracticable gorge, formed on both sides of granite, and the granite reaching to within a few hundred feet of the summit of Seeahee Devee (covered with Pines), 7,200. The water, clear as crystal, dashes on amidst quartz rocks, or reposes in deep blue and green pools, its banks covered with a subtropical vegetation, "which may have crept in with the tigers and hot winds, behind the alpine oak-crowned barrier of the Gagur." On the Khyrna river, whose cold-flowing waters come from a far country, elevated only 3,000 feet, there was severe hoar-frost at night. In the list of plants we find *Bauhinias*, *Dalbergia* and *Acacias* mixed with *Clematis*, *Thalictrum*, *Pyrus*, and *Rosa Brunonii*; *Bauhinia Vahlii* yields a strong and excellent rope in the fibre of its bark, while the leaves are in general use to contain *ghee*; and *Dalbergia Ougeinensis* affords admirable timber for ploughs, furniture, &c. The enormous tubers of *Pueraria tuberosa* are collected and exported to the plains on account of their cooling properties. The fruit of *Terminalia Chebula* is called "mother of doctors." *Röttlera tinctoria* of the plains meets *Andromeda ovalifolia* at an elevation of 4,000 feet. The native name for *Saxifraga ciliata* is "*Silphora*" (the stone-breaker),—the same derivation as our own appellation. One is surprised to find here several north of Europe plants, as *Nasturtium officinale*, *Ranunculus sceleratus*, *Veronica Anagallis*, &c., only at very inferior elevations of the mountains: they disappear between 4,000 and 5,000 feet, "a circumstance which may be accounted for, as hinted by Humboldt, by the diminished pressure of the atmosphere."

To Nynee Tal, twelve or fourteen miles, involving an ascent of 4475 feet, of which a considerable portion is steep and continuous to the Ulmah-ka-khan pass, 7431 feet above Calcutta. During the latter portion of the ascent the mountain scenery becomes exceedingly grand: to the right and a-head, the vast summit and inaccessible steeps of Cheenur ("the broad-browed monarch of the Gagur, 8,526 feet high") are feathered with Cypress and Oak; to the left are Lurria Kanta Peak and its spurs; to the north, at a profound depth, is the bed of the torrent,

blocked up with great boulders,—and over and beyond it the long line of the Snowy Range. The forest on the road-side consists for the most part of *Pinus longifolia* and *Quercus incana*, both of large dimensions. From the crest of Ulmah-ka-khan there is an abrupt descent of about 1,100 feet to Nynee Tal, a celebrated, but still somewhat overpraised lake, a small tarn, indeed, extending about seven furlongs in length, with a maximum breadth of about two and a quarter; the greatest depth is eighty feet. The water is perfectly clear, and under the generality of the skyey influences, exhibits a blue which reminds the traveller of a reach of the upper Rhine or Lake Zug, in Switzerland; the latter is however much larger than Nynee Tal. Near the brink the surface is matted with a tangled mass of *Potamogeton mucronatum*, *Myriophyllum Indicum*, *Chara verticillata*, *Polygonum scabrinervium*, and the pretty English *Polygonum amphibium*, which here, and here only in India, so far as Major Madden's experience goes, raises its pink spikes *above* the water. Wherever free from these plants, the surface reflects its splendid frame-work of mountain and wood, like a mirror. The lake is separated from the plains to the south-west by the rugged mountains of Uyarpata, so named from the predominance of *Andromeda* in its woods, which also abound in admirable specimens of the green Oak, *Quercus dilatata*. Ghiwalee is an extensive tract adjoining, south of Uyarpata, with precipices to the very brink, of which the woods are composed of Oak, Ash, Maple, Siberian Crab, Cypress, and other northern forms; while the sward abounds in the *Primula denticulata*, *Parnassia nubicola*, &c., and Pæony at no great distance. Immediately beneath is the semitropical vegetation of northern India. The cliffs are slowly wearing away; and many of these Oaks, &c., must be carried down by the torrents to mingle with *Naucleas*, *Odinas*, &c., below.

On reaching the crest, as seen from the lake, it is found to run back towards the north-west for perhaps 1,200 yards, as a level ridge, exactly in the line and direction of the lake's length. This summit is clothed with a brushwood of *Indigofera*, *Spiræa*, *Elsholzia*, and *Salix*: *Androsace lanuginosa* covers the rocks: *Anemone discolor* occurs in the shaded places; and at the cairn of the surveyors, grew a new *Stellaria* (*semivestita*, Edgew.) and the *Hemiphragma heterophyllum*. The Holly (*Ilex dipyrena*) reaches a great size; one, measured near the ground, was between sixteen and seventeen feet in girth; but the characteristic

tree of Cheenur is the *Quercus semicarpifolia*, which fringes the crest and covers the whole south-west face. Budhan Dhoora and Satcholium, points of nearly the same altitude and at no great distance, on each side of Cheenur, have not a trace of it; and on the former I could only find a few specimens of *Colquhounia vestita*, a very common shrub at Nynee Tal and towards Budreenath. The *Limonia Laureola*, too, occurs only in this locality on the Gagur range; and though the Cypress is said to exist in Dhyanee Rao, it appears to be in small quantity, limited to a grove or two: the face of Cheenur, towards the lake, on the contrary, bristles with groves and clumps of this dark and stately tree, which recurs, though in diminished numbers, on the Ghiwalee cliffs, as low down as 5,100 feet. The Sher ka Danda (8,023 feet) alone in this neighbourhood affords the *Quercus lanuginosa.*

The list of the more common plants of this region is an exceedingly interesting and extensive one, chiefly European forms. Among the trees are enumerated *Cupressus torulosa*, *Pinus longifolia*, *Fraxinus floribunda*, *Betula cylindrostachya*, (or *nitida*), *Alnus Nepalensis* or *obtusifolia*, *Quercus incana*, *Q. lanata*, *Q. semicarpifolia*, *Q. dilatata*, *Q. annulata*, *Acer oblongum*, *A. lævigatum* and *cultratum*, *Populus ciliata*, *Symplocos paniculata*, *Rhododendron arboreum*, &c. Of this latter Major Madden observes that it attains a height of forty feet with a trunk in one case thirteen, in another sixteen, feet in girth. One on Singabee Devee measures fourteen feet and a half round at five feet from the ground. Cattle are said to be occasionally killed by eating the flowers and young leaves.

From Nynee Tal to Kaledhoongee, twelve miles, with 5,700 feet descent. Of course here the vegetation became more tropical and less interesting; *Ficus Indica*, the sacred Fig of India, and the *Ficus religiosa*, or *Peepul*, are both found here and both held sacred. The root-stems of the former make excellent poles for the Dandees, on account of their toughness and elasticity; but they are not cut till the "indwelling, arborescent god has been appeased by the sacrifice of a goat;—that luckless beast which, on every occasion, bears the brunt of the sins, real or imaginary, of all Kumaoon."

Peepul, Major Madden tells us, is derived from *pa*, to preserve; and the practice of all India bears out the etymology; not even a sacrifice atones for the crime of wounding and maiming it, and fortunately the wood is useless; and he suggests that the *Arbor Populi* of

the Romans derived its name from this. "Why," he asks, "did the Romans select the Poplar? May it not have been from some lingering association brought by their ancestors from the east? their language is full of Sanscrit forms and terms: why should not Sanscrit ideas have been imported with them, and the *Poplar* chosen as the best representative of the *Peepul*? The latter is sacred to Vishnoo, the Sun; and we find the former connected with the legend of Phaeton, whose sisters, the Daughters of the Sun, were changed into Poplars." Much of the rest of this journey, and return to Almorah, was through regions of moderate elevation, and contains information which will hardly bear curtailing. We conclude our extracts by the following, upon the effect of climate on vegetation in the Himalayah.

"The mean annual temperature, at 7,500 feet elevation, is nearly that of London, but the fact that few of the trees, indigenous at that altitude, can stand an English winter, points to a signal difference of conditions in the distribution of Himalayan heat and moisture. Dr. Royle well observes, according to astronomers, that 'in advancing north from the Equator, the sun passes over 12° in the first month, 8° in the second, and only 3½° in the third; and that hence, from his longer presence there, and the greatly increased length of the day, the heat is more intense at the tropic than at the Equator: at the latter, the sun is more or less vertical for about six days only, at the latter for nearly two months.' The distance of the Himalaya from the northern tropic is not great, and where we have a southern exposure is more than compensated; there, indeed, the sun's rays strike vertically with intolerable power, augmenting in the ratio of our ascent, so that one is absolutely scorched while walking on a glacier. What a contrast also between the generally serene brilliant sky and extremely dry atmosphere of the Himalaya, during eight or nine months of the year, and the cloudy canopy which so generally rests over the British Islands! The sun's arrival at the tropic of Cancer is marked here by that of the rainy season, when the previously dry atmosphere is suddenly, and for three months, saturated with moisture, with a sun potent enough to knock down an ox, when he does show himself, which is but seldom. During this period, one is alternately baked and chilled half a dozen times during the twenty-four hours, and that not in the low confined, but on perfectly open, ridges, where it is consequently a matter of some difficulty to adjust one's clothing to the

frequent fluctuations of temperature, the annual change of dress which Mr. Fortune describes amongst the Chinese being here diurnal."

Lieut. R. Strachey had mentioned a remarkable phenomenon to Major Madden, that the seeds of the same species of plant ripen much earlier on the lofty passes of the Himalaya than at their base.

M. BOURGEAUD'S *intended Excursions in* SPAIN.

M. Bourgeaud of Paris has distinguished himself as a Botanical Collector, 1st, in the Canary Islands, 2ndly, in the Pyrenees, and 3rdly, in Corsica and the French Mediterranean coast. Not only are his specimens well preserved, but well selected, and liberally supplied to the subscribers. They have the further advantages of being well named by able botanists, and offered upon reasonable terms. No wonder therefore if the demand for them is considerable, and if, of his last collections, the demand exceeded the supply.

M. Bourgeaud has been advised during the present year, we believe by the Professors of the Jardin des Plantes at Paris, to prosecute his researches in Spain, suggesting either the environs of Malaga, in the extreme south, or of Madrid in the interior. Either of them we believe to be good localities, and well worthy of the exertions of so experienced a Collector, and we are much mistaken if there will not be found a disposition to encourage him by the botanists of this country as well as in France.

PLANTÆ FENDLERIANÆ.

The nature of Mr. Fendler's collections from North Mexico (and which have now been transmitted to the subscribers) is noticed at p. 44 of our London Journal of Botany. The specimens have all the beauty and perfection of those of M. Bourgeaud, with the additional merit of coming from a most interesting country. Dr. Asa Gray has, we have reason to know, prepared a named catalogue of this collection, which will be printed in the forthcoming volume (vol. iv.) of the Memoirs of the American Academy, and which, we believe, will also be delivered to the subscribers *gratis*.

We learn with much satisfaction that Mr. Fendler has it in contemplation to spend a season in a very interesting and unexplored country ;

namely, the great Salt Lake region lying at the back of California, where he will botanize in the adjacent mountains. His residence will be at the Mormon city, and he will proceed thither by the route of Santa Fè in North Mexico.

The late Dr. Taylor's Herbarium.

It may be interesting to many of our readers to know that the rich Cryptogamic Herbarium of the late Dr. Taylor, with all his drawings and MSS., were purchased by a distinguished and patriotic individual of Boston, U.S.A., Mr. Lowell. Happily there are many rising Cryptogamic botanists in the United States who will avail themselves of the treasures existing in this collection, while describing the plants of their own country.

NOTICES OF BOOKS.

Revisio critica generis Potentillarum, *et Flora* Africæ Australis.

Dr. and Prof. Lehmann of Hamburgh, having brought to a conclusion the *Plantæ Preissianæ*, is, we are happy to say, engaged in a work on the now very extensive and beautiful genus of *Potentilla*, to which there have been such great additions since the result of his labours, a Monograph of the same genus, appeared in 1820. We are sure that botanists throughout Europe will aid by communicating new or rare species, or by the loan of such to the able author.

The same indefatigable botanist is also collecting materials for a Flora Africæ Australis, towards the construction of which he is already in possession of the very rich stores of Ecklon and Zeyher, Drège, Dr. Pappe, Baron Ludwig, &c., &c.; and he is continually receiving new acquisitions from the Cape.

Botanical Appendix to Capt. Sturt's *Expedition into* Central Australia; *by* Robt. Brown, Esq., &c., &c. 1848.

It is enough that we say this is from the pen of Mr. Brown, to stamp it as a work of high merit. The catalogue of species is not

extensive, but it includes several plants of extreme interest. "It consists," the author says, "of about 100 species, to which might be added, if they could be accurately determined, many other plants, chiefly Trees, slightly mentioned in the interesting narrative which is about to appear, and to which the present account will form an appendix. I may also observe, in reference to the limited number of species, that Capt. Sturt and his companion, Mr. Brown, seem to have collected chiefly those plants that appeared to them new or striking, and of which the collection contains a considerable proportion. In regard, too, to such forms as appear to constitute genera hitherto undescribed, it greatly exceeds the much more extensive Herbarium collected by Sir Thomas Mitchell; in which the only two plants proposed as in this respect new, belong to genera already well established, namely, *Delabechia* to *Brachychiton*, and *Linschotenia* to *Dampiera*."

In this valuable contribution to the Flora of the Southern Interior of Australia, we have, among other novelties, *Blennodia*, a new Cruciferous genus, allied to *Matthiola*: *Sturtia*, near *Gossypium* and *Senra*: *Tribulopis*, allied to *Tribulus*: *Clidanthera*, *Pentadynamis*, and *Petalostylis*, among *Leguminosæ*: *Podocoma* (*Compositæ*), and *Leichardtia* (*Asclepiadeæ*).

In the brief space of twenty-nine pages the learned author has given a great deal of valuable information bearing on genera and species not described in this work. He estimates the number of Australian species as not exceeding, but rather falling short of, 7,000.

Annales Botanices Systematicæ.

In our last number we announced the appearance of the first part of this new work of Dr. Walper's, and the nature of it was noticed. It included families (arranged according to De Candolle's Prodromus) extending as far as *Celastrineæ.* The present, or second fasciculus of the first volume, closes with the commencement of the *Compositæ.* The addition of species in the short time that has elapsed since the appearance of the "Repertorium" of the same author, is quite remarkable, and exhibits clearly the progressing state of the science. Of *Astragalus* alone there are thirty-seven species, and we could add to them considerably in new species lately named by Boissier, in our own Herbarium, and which he is about to publish in the continuation of his valuable "Diagnoses Plantarum præsertim Orientalium."

On the Genus Triguera *of* Cavanilles: *by* John Miers, Esq., F.R.S., F.L.S., &c.

Triguera.

This hitherto obscure genus was first described in 1786 by Cavanilles (Diss. 2. Append. 2. tab. A.), where a rough figure is given of one of its species. Poiret also, in the Dict. Meth. vol. viii. p. 99, offers a tolerably good description of the two enumerated species, and Lamarck in his Illustr. Tab. 114, has copied Cavanilles' drawing of *T. ambrosaica*; these authors correctly class the genus among the *Solanaceæ.* At a much later period it was, however, referred by Don to the *Nolanaceæ*, evidently from a misconception of its fruit; but by Endlicher and other botanists, it has since been placed at the end of *Solanaceæ*, as a doubtful genus of the order. Indeed nothing certain seems to have been known of its structure, and it is strange that a plant, apparently widely diffused throughout the south of Spain, should have altogether escaped the notice of all botanists except M. de Boissier, during the last forty years; it seems at all events to have been quite unknown to English botanists, not a single specimen, so far as I can trace, having existed in any British herbarium. I have been fortunate in obtaining much satisfactory information on this subject, and feel greatly indebted to M. de Boissier, whom I had the pleasure of seeing this summer in Geneva, for the kind and generous manner in which he opened to me the contents of his rich herbarium, and for his liberality in giving me a specimen of *Triguera ambrosaica*, from which I have made the following analysis. *Triguera*, from the facts thus collected, will be seen to be not only a truly Solanaceous genus, but one closely allied to *Solanum*: in the structure of its stamens, and their arrangement upon the outside of a free epipetalous annular ring surrounding the ovarium, it approaches the genus I described on a former occasion (Ill. So. Am. pl. p. 33. tab. 8) under the name of *Pionandra* (now the *Cyphomandra* of Dr. Sendtner); but it differs from that genus in the form of its corolla, in its seeds, and its distinct habit. In this respect it also resembles the genus *Ectozoma*, which I have founded upon a plant from Peru, that has its stamens fixed in like manner, upon a free epipetalous ring. *Ectozoma*, however, has a corolla with an imbricate æstivation, and therefore belongs to the *Atropaceæ*, where it is placed in the tribe of the *Solandreæ*, near *Juanulloa* (Ann. Nat. Hist. 2nd Ser. vol. iii.

Ill. So. Am. Plants, vol. ii. pl. 53). The following is offered as an emended character of the genus from my observations upon the specimen above referred to.

TRIGUERA, *Cav.* Char. emend.—*Calyx* profunde 5-partitus, submembranaceus, persistens, laciniis subæqualibus, lanceolatis. *Corolla* campanulata, limbo 5-lobo obliquo, lobis inæqualibus, brevibus, obtusis, mucronulatis, superiori breviori reflexo, 2 inferioribus erectioribus, æstivatione induplicato-valvata. *Stamina* 5, inclusa; *filamenta* brevia, glabra, imo in urceolam mellifluam liberam annularem e basi corollæ ortam coalita; *antheræ* magnæ, conniventes, oblongæ, inferiori paulo minori, basi cordatæ, imo dorsi affixæ, 2-loculares, apice 2-cornutæ, introrsæ, loculis parallelis adnatis, primum poris geminis apicalibus, demum rimis longitudinalibus intus dehiscentibus. *Ovarium* subglobosum, 2-loculare, pauci-ovulatum, ovulis dissepimento placentifero utrinque adnatis. *Stylus* simplex, gracilis, persistens. *Stigma* parvum, obtusum, globoso-clavatum, cavum. *Bacca* sicca, 2-locularis, calyce aucto membranaceo suffulta, cortice membranaceo, dissepimento tenuissimo, subobliterato. *Semina* 4-6, magna, compressa, reniformia, hilo in sinu profundo laterale: *testa* favosa: *embryo* intra *albumen* carnosum spiraliter curvatus, teres, *radicula* ad angulum basalem spectante, hilo laterali evitante, *cotyledonibus* semiteretibus sublongiore.—Herbæ *Hispanicæ annuæ narcoticæ sæpe muscum redolentes*, folia *alterna*, *sessilia*, *subdecurrentia*, *obovata*, *sinuato-dentata*, *vel integra*; pedunculus *extra-axillaris*, 2-*fidus*, 2-*florus*, pedicelli *graciles*, *articulati*, *nutantes*, corolla *superne cœrulescens*, *imo albescens*, *et radiis* 5 *albidis notata*.

1. *Triguera ambrosaica*, Cav. Diss. 2. App. 2. tab. A. Triguera baccata, *Gmelin*, *Syst.* vol. i. p. 338. Verbascum Osbeckii, *Linn. Sp.* pl. 255. *Rdb. Cent.* vol. v. tab. 17. fig. 52. *Tournef. Itin.* vol. ii. p. 83. *cum icon.*—Annua, caule sulcato, subalato, glabro; foliis radicalibus, integris, glabris, caulinisque obovatis, sessilibus, imo cuneato integro in angulis alatis decurrentibus, hinc grosse serratis, apice obtusiusculis, glauco-viridibus, utrinque glabris, margine ciliatis; pedunculo solitario, lateraliter sub-axillari, bifido, pedicellis e glandulis totidem cupuliformibus articulatis, calyceque dense lanato-pilosis; corolla purpureo-violacea, glabra, lobis rotundatis extus pilosis, urceolo staminifero brevi, ovarium dimidio includente.—Hispania, Prov. Andalusiæ.—*v. s. in herb. cl. Boissier.*

The plant appears to grow to the height of a foot, its herbaceous stem being erect and simple, rarely showing one or two lateral branchlets out of the axils. The leaves measure from $1\frac{1}{4}$ to $1\frac{3}{4}$ inch long, and 7 to 10 lines in breadth, the mid-rib and margins being decurrent on the angles of the leaf. A very short peduncle springs laterally from the point of insertion of the leaf, and exhibits two fleshy cupuliform glands, one a little above the other, and out of which arise the more slender pedicels, about five lines long, which are deflected; the calyx is four lines in length, and divided nearly to its base into somewhat acute segments, which in fruit grow to a length of six lines, and envelope the berry. The corolla, seven lines long, is campanular, somewhat oblique, the lobes of its border short and rounded, the two higher ones with the shorter stamen being exterior; the length of the perigynous ring is one line, the filaments half a line, and the erect anthers two lines, these burst in front, not only by nearly apical pores but by longitudinal fissures; the dorsal connective is extended beyond the anther cells, and appears like two short erect teeth. The berry forms a globular indehiscent capsule, quite devoid of pulp, the pericarp and dissepiment being very membranaceous, and about five lines in diameter. It contains four, generally six or eight seeds, which are very large in regard to the fruit; they are compressed, somewhat reniform, with a deep narrow sinus about the hilum, and are two lines in diameter; the testa is remarkably favose, the ridges being prominent and crenulated; the embryo, enveloped in albumen, is terete, somewhat spiral, with the point of the radicle directed towards the basal angle. The plant has the peculiar smell of musk.*

2. *Triguera inodora*, Cav. loc. cit. app. 3.—Planta tota glabra, foliis ovato-lanceolatis, integerrimis, marginibus vix decurrentibus, lævibus, pedunculo calyceque glabris; corolla pallide violacea, urceolo staminifero majore, ovarium totum includente.—Hispania, Prov. Andalusiæ.

This species is represented as being altogether glabrous, with a simple stem only six inches high, the leaves quite entire, and scarcely decurrent on the stem; the flowers are said to be larger and more handsome, with a somewhat shorter corolla; the whole plant is quite inodorous.

* A drawing of this species with sectional details will be given in a Supplementary Plate in vol. ii. Ill. So. Amer. Plants.

Dr. Thomas Thomson's *Scientific Mission to* Thibet.

(*Continued from* vol. vii. p. 657 *of London Journal of Botany*.)

Camp, Bhadarwa, June 2nd, 1848.

In my last letter (of 1st May) I endeavoured to give you some account of my impressions of Kashmir: at the same time I told you that it was my intention to proceed towards Jamu for the purpose of sending to the plains my last year's collections, and that I would give you a sketch of the route which (were I permitted to continue my travels) I intended to pursue. A day or two ago I received information that Government had sanctioned my spending another summer in Thibet; and I am now making the best of my way towards Le, with the intention of penetrating as far to the northward as may be practicable, and of returning to Kashmir in September. I look forward to my journey with great delight, as a great part of my route having never been investigated botanically, I trust I am not unreasonably sanguine in anticipating much novelty, if not in species, at all events in geographical distribution.

I started from the city of Kashmir on the 2nd of May. My road lay up the valley, and as the river is navigable for nearly thirty miles, I embarked all my effects in boats, providing at the same time a small boat for my own use, when I should find the banks uninteresting or unproductive, which from the flatness of the country, and the extreme sameness of the vegetation, was the case oftener than I could have wished. In the immediate neighbourhood of the city of Kashmir, the plain is very little above the level of the river, and consequently quite swampy. Higher up, however, the width of the extremely low tract is more limited; and the greater part of the plain is occupied by a table land thirty or forty feet above the river, and consequently perfectly free from wet. This table-land (composed of lacustrine clays and sands) is either cultivated or covered with short turfy grass. The principal cultivation, as in the drier parts of the low grounds, was Wheat and Barley, with now and then a good deal of oil-seed (*Sinapis*). In the fields of Wheat and Barley, weeds were exceedingly abundant, almost all of European families, and many of the species identical with those of Europe. There was also a good deal of Saffron cultivated. The highest and driest land appeared to be selected for this purpose; and in addition, the fields are divided by trenches into elevated beds between four and five feet square. The Saffron was not in flower, but in full

leaf, and apparently promised a very luxuriant crop. On the low parts of the plain I met now and then a good deal of swampy ground, producing the same plants as the bank of the Kashmir lake. Where not too much under water, these swampy tracts are laid out in rice-fields; but the season for rice-planting not having arrived, they are now bare. Two days from Kashmir I halted a day, for the purpose of climbing a high mountain, which rises isolated on the north side of the valley. This mountain, which was ascended by Jacquemont, who gives its height as rather more than 10,000 feet above the level of the sea, is called in his journal "Vestervonne:" Wasterwan is an approach to the true pronunciation. My trouble was well repaid by a considerable number of new species; though much fewer, of course, than I should have got a month later. The southern slope by which I ascended was bare and rocky. At the bottom I found the ordinary vegetation of the low hills about Kashmir, namely, species of *Berberis*, *Rubus*, *Daphne*, *Rosa Webbiana*, &c.: a *Zizyphus* is common, but hardly in leaf. The most remarkable novelty was *Prangos pabularia*, in great abundance near the foot of the mountain. It was just coming into flower, and exceedingly luxuriant, forming thickets as high as a man. Several other gigantic *Umbelliferæ* were also common. Higher up, the most abundant plant was a Tulip, which I believe to be *T. stellata*, Hook.; judging at least, by its expanded flowers, the leaves of the perianth were quite patent, red externally, and pure white within. Here and there among the rocks grew a few plants of *Fritillaria imperialis*: the rocks were also adorned with the large leaves of *Saxifraga ciliaris*, already almost past bloom.

As only the early spring-plants were in perfection I can give you no good idea of the vegetation, but may mention that I added to my collection a *Nepeta* with lanceolate leaves, a purple *Oxytropis*, and a yellow unarmed *Astragalus*. On reaching the top I found it partially covered with large patches of snow. The summit was rounded, bare and grassy, but the north face was covered with wood commencing a very few feet below the top. On the grassy turf close to the snow grew many beautiful plants. Most common was that abundant spring-plant of Himalaya, *Primula denticulata*: a *Gentian*, an *Anemone*, and a *Callianthemum* (mentioned by Falconer in Royle's Illustrations) were the other species. From the steepness and rockyness of the southern slope, these plants did not occur till I reached the top; but on the northern

slope, which was gentle and grassy, they descended along the edge of the snow for several hundred feet. The wood which covered the greater part of the north face was still almost leafless, but by the fallen leaves or the buds I recognised an *Acer*, a *Cerasus*, and *Pavia*. Close to the top nothing grew but Birch, known at once by its silvery bark peeling off in large flakes: it was only commencing to flower. The ground under the trees was still covered with snow, so that nothing was to be looked for there.

The navigable part of the Thelam terminates at the town of Islamabad, and with it also the wide part of the valley. In the neighbourhood of Islamabad five or six streams descending from the mountains in different directions unite to form the Thelam. They are separated from one another by mountain-ranges, lofty where they branch off from the snowy range, but gradually sinking in height, till at last, near Islamabad, they sink into the plain. The valley up which my road lay, is the most southerly of all, and had consequently the snowy range for its south boundary. Two days' journey from Islamabad brought me to the foot of the pass by which I was to leave Kashmir. These two days' journey were through a very different country from the great plain. The valley was perhaps two miles in width, sloping gently, and covered with Rice fields still quite bare, without even any indication of approaching cultivation. The abundance of water for irrigation was, I presume, the cause of Rice being the universal crop. I did not see a single field of Wheat; and with the Wheat and Barley, the whole of the weeds, which had been so abundant and constituted by far the greater part of the plants in flower, disappeared also. The stream was rapid, and had a wide gravelly bed. *Myricaria*, and a spinous *Astragalus*, characteristic of a dryish climate, were common on its bank.

The Banahal Pass, so called from the district of that name which lies to the south of it, is less elevated than I anticipated, scarcely above 10,000 feet. The ravines on the ascent to it were still full of snow, as were the woods facing the north, but the ridge up which the road lay was almost free. On the top there were large patches of snow, but it was not continuous; and the southern slopes were quite free from it. To the north, I observed a good deal of wood, composed principally of *Acer*, *Pavia*, and a Cherry with racemose flowers. On the upper part of the ascent, Birch appeared, and near the top it became the most abundant tree, and was mixed with a few trees of a Pine (*Picea*).

The top of the pass was bare, not, however, because I had got above the limit of trees, for at a short distance Pine-forest might be seen considerably higher. The snow had evidently only recently melted from the grassy slopes, very few plants being in flower. The most conspicuous was an elegant little bright blue *Boraginea*, a species, I think, of *Moltkia*, which was extremely plentiful. The descent on the south side, which was very steep, was almost bare of trees, only a few small ones (and not one Pine) being visible in the ravines. The valley of Banahal, into which I descended from the top of the pass, was about 5,500 feet in height, or only a few hundred feet above the town of Kashmir, so that circumstances were favourable for determining the amount of change which had taken place in the vegetation. The first difference which I noticed, was, that everything was much further advanced : plants, which in Kashmir were only beginning to come into leaf, being here in full flower. Many, indeed most of the species, however, were the same as in Kashmir : some of the most characteristic plants (*Rosa Webbiana*, *Fothergilla*, *Ulmus*, *Zizyphus*, &c.) *Myricaria*, however, had disappeared, as well as the two Irides which were so abundant and conspicuous there. It is more difficult to determine what species had made their appearance which did not occur in Kashmir, for the greater progress of vegetation may have brought many plants into notice which there had not commenced to vegetate. A species of Oak, however, was found sparingly in the forest and hill-sides, which certainly did not occur to the north of the pass ; and I noted a number of others which I had not seen in Kashmir ; all, however, from the cause I have just doubtfully mentioned.

From Banahal to the river Chenab I made three marches, descending from 5,500 to 2,500 feet, and only once ascending to about 8,000. The banks of the stream were in general covered with very dense forest, principally a magnificent Alder, and a *Celtis*, also very large. *Fothergilla* continued plentiful ; and with the decreasing elevation some plants, which are confined to low levels, made their appearance : *Marlea* was one of the first. Higher up the hills there was no forest, but grassy slopes frequently mixed with rocks. Many plants occurred which showed that I had not yet got into the ordinary Himalayan flora. *Dictamnus* was plentiful, with a *Dianthus*, and prickly *Astragalus*, as well as many other Kashmir plants ; and most conspicuous of all a magnificent *Asphodelus*, with its long stipitate

flowers in dense racemes upwards of a foot long. This, which is probably the *A. pyramidalis* of Royle (for I found it last year in fruit in Kunawur) as well as the splendid species of *Ornithogalum* (?) of Falconer, noticed by him, appears to belong to the genus *Eremurus* of Bieberstein, and though differing in one or two trifling points from the description, is perhaps not specifically distinct from the Caucasian and Altaic species. As I advanced to the south, new plants (principally ordinary Himalayan forms) appeared in succession: first came *Quercus lanata*, then the common *Andromeda* (*Pieris ovalifolia*), and others followed, till at last the elevation became too low for even these, and all gave place to ordinary tropical forms. The valley of the Chenab being enclosed on both sides by high mountains, I descended into it from a height of 8,000 feet, and next day ascended again to a cool climate, so that I had only one day of heat. The rapidity of the descent and ascent gave me good opportunity of observing the gradual change of vegetation; but so much depends on the exposure, and the more or less wooded nature of the mountain-side, that no precise limit can be laid down between temperate and tropical vegetation, nor can fixed heights be stated at which plants cease or begin to grow. Even on the river bank (2,500 feet) certain plants of temperate climates were common, especially on the south side, where they found more shade; but the greater part of the plants were tropical, and in general the same as those of the valley of the Sutlej; *Dalbergia Sissoo*, *Rottlera tinctoria*, *Adhatoda*, *Acacia Lebbek*, *Bauhinia*, and *Colebrookia* being the most common. As might be expected, too, the productions of the plains of the Punjab, which do not occur further east, occurred here instead of others which do not extend west; thus *Zizyphus microphylla* replaced *Z. Jujuba*, and *Acacia modesta* and a prickly *Celastrus* other species. Besides the ordinary tropical forms, one or two anomalous plants occurred, of which a prickly *Astragalus*, perhaps the Kashmir species, puzzled me most: I found it however afterwards still lower, and nearer the plains, within thirty miles of Jamu. *Olea cuspidata* and a white Kashmir *Daphne* (*D. coriacea*, Royle?) seem to affect a dry climate. The former is common from the Indus and extends as far as Kamaon, but probably only in the drier parts near the snow. The *Daphne* is plentiful on the lower Indus (below Iskardo) as well as in Kashmir, and in all the hot valleys near the Chenab, and it extends as far east as Lower Kunawur, not however apparently descending on the

ing on the Sutlej, below 5,000 feet, which is about the elevation at which the climate begins to become dry.

After crossing the Chenab, the road ascended again rapidly. I encamped at 5,000 feet, and next day got up to probably a little more than 9,000. The forests had now assumed entirely the ordinary aspect of the neighbourhood of Simla, and as a consequence I met with little novelty. The upper part of the ascent was through a beautiful forest of *Picea*. This tree being exceedingly abundant in the Himalaya range, throughout its whole extent, you might naturally suppose that it would be easy to say whether more than one species occurred, or whether *P. Pindrow* be distinct from *P. Webbiana*, but the leaves are so exceedingly variable that no conclusion can be drawn from them, and unfortunately the cones are generally on the very highest branches and quite inaccessible to a traveller. Both species (or supposed species) seem to be cultivated in England, but I do not know whether a comparison of them in a cultivated state has afforded satisfactory characters.

From the top of this pass the descent was rapid. On the second day I reached tropical vegetation, and the remainder of the march to Jamu was among low hills, far too little elevated for any temperate vegetation. As I approached the plains, the number of common low plants increased, and that of stragglers from higher levels diminished, but I did not, as I had anticipated, find many new species, the hills seemingly producing none of the peculiar plants which in Kamaon grow at the foot of the Himalaya. Of mountain-plants *Pinus longifolia* (which you are aware thrives well in very hot climates and even on the plains) was the one which remained longest, and though not very tall, it was exceedingly luxuriant, and looked fresher and greener than 2,000 feet higher. I reached Jamu on the 19th of May. The heat was very great, and detained me there three days, during which I made ready my collections for despatch to the plains, and it was not till the 23rd that I recommenced my march. I had determined to proceed to Chambee on the Ravi, but as I found that the direct road lay almost entirely among the lower hills, and was therefore not only intensely hot but also botanically very unproductive, I took another route by Ramnagar and Bhadarwa, which though two or three days longer had the advantage of being temperate.

From Jamu to Ramnagar was entirely tropical, the latter town

being about 3,000 feet. At this height some little of the temperate vegetation was already beginning to appear, and the blending of the two was often exceedingly curious. *Pinus longifolia* grew alongside of the Date Palm (*Phœnix sylvestris*); Alder was mixed with *Röttlera* and *Rondeletia*; a Wild Pear with *Dalbergia Sissoo*; *Trichodesma Indicum* and *Solanum Jacquini* with *Micromeria* and *Fragaria Indica.* Beyond Ramnagar I rose rapidly, the first day to 5,000, then to 7,000, and two days afterwards to 10,000 feet. The flora, however, nearly to the latter point, was the ordinary Himalayan flora, *Fothergilla* being one of the few Kashmir plants which have not disappeared. Yesterday, however, starting from 10,000 feet, I crossed a ridge almost as high as the uppermost tree-level. By an accident my thermometer had gone on, so I was unable to determine the boiling point of water, but I must have attained a height of 11,500 feet. I had never before an opportunity of seeing the spring flora at this elevation, and I certainly was very much gratified. There was no very great variety, but the immense profusion of *Rhododendron campanulatum*, in full flower, was (seen for the first time) extremely beautiful. I crossed no snow, except in ravines, but observed plenty along the road. There was nothing novel in the plants which I collected. *Primula rosea*, *Caltha*, *Onosma bracteatum* (?), a bright blue Gentian (which, by the way, I have not been able to name) and a dirty green by no means handsome *Fritillaria* (with no cirrhi to the leaves) were the prevailing plants. *Quercus semicarpifolia* was the common tree in the forest, with *Picea* and *Pinus excelsa*. Lower down, *Cedrus Deodara*, and *Abies Smellieana* were common; and as I descended the ordinary trees of the forest made their appearance.

Camp, Nubra Valley, 2nd of August, 1848.

I had fully intended to give you an account of the progress of my journey long ere now, but have been prevented doing so by a complication of causes; partly by a press of work which left little time for writing, and at Le, where I spent a week, by a violent fit of idleness, for I did little or nothing the whole time I was there, and latterly from not having been very well, principally, I believe, from the effects of great elevation, as my illness, which proved nothing serious, commenced while crossing the pass between Le and this place. A few doses of quinine

have set me to rights, and I am now preparing to start for the Karakoram range, which will be the termination of my travels.

If my letter of the second of June reached you, as I hope it did, you will be aware that I had received the sanction of Government to my continuing my journey, and returning to Thibet for the purpose of visiting the mountains to the north of the Indus. In that letter, I believe, I mentioned to you the route which I intended to follow, and the plan which I there laid down has scarcely been in the least deviated from. From Bhadarwa I was obliged to cross a mountain range into the valley of the Ravi; the snowy range to the south of the Chenab, in which direction I wished to go, being impassable without making a détour. One day's journey took me to the top of this range, and I encamped close to the summit at an elevation of 10,000 feet, among large patches of snow. The vegetation at this point was pretty much the same as on the ridge I had crossed two days before. The snow having but recently melted, only the earliest spring plants were in flower, principally *Primula denticulata* and *rosea*, a very beautiful Gentian, a Valerian, *Trillium*, &c. The trees were only just beginning to show their leaves; but *Rhododendron campanulatum* and *Viburnum nervosum* were covered with blossoms. From this ridge I followed for three days the course of a stream descending towards the Ravi in a S. E. direction, snowy ridges still preventing me from proceeding north as I wished to do. At last on the fourth day, I reached a stream which from the north joined that I had been following, and turning up it, three more marches brought me close to a pass over the high snowy range to the south of the Chenab. During these six marches I descended a little below 5,000 feet, and reascended again to 10,500. At the lowest point which I reached the transition in the vegetation had commenced, but was far from complete. Oaks had not disappeared, but *Olea*, *Xanthoxylon*, an *Acacia*, the common Hill Fig, *Cæsalpinia sepiaria*, &c., had become common. The Oak was *Quercus lanata*, accompanied as usual by *Rhododendron arboreum* and *Pieris* (*Andromeda*) *ovalifolia*. These trees were all absent at Bhadarwa, and as a general rule they seem to be confined to the outer ranges of the mountains, and not to penetrate into the valleys between the branches of the snowy range.

On the 11th of June I had reached the upper part of the valley which I had been following, and encamped at the elevation of 10,500

feet close to the foot of the lofty range of mountains which separated me from the Chenab. The next day I crossed the pass, the height of which I found to be 14,695 feet. On the early part of the ascent I obtained many beautiful and interesting plants, but nothing I believe which had not previously been found elsewhere at similar elevations. Throughout the early part of the ascent, snow only occurred in patches, but from about 12,000 feet it was continuous, except where a few rocky pinnacles and ridges afforded no room for it to lie. On these small rocky patches, surrounded on all sides by fields of snow, many plants occurred in flower. Here I found a lovely Primrose (I think *P. purpurea*, Royle), a purple *Sibbaldia*, a little *Pedicularis*, *Picrorhiza Kurrooa*; and even at the top, which, consisting of a mass of rugged rocks, was free from snow, I observed a little yellow *Draba* and a very minute *Primula* (*P. minutissima*) growing in the crevices in great abundance. From the range of mountains which I had now crossed the Chenab river was only about ten miles distant, and beyond lay the grand snowy range which still separated me from Thibet. To reach the pass by which I intended to traverse these mountains, after crossing the Chenab, I made two marches along its course, and on the third at a place called Chatargarh, turned again to the north, ascending a valley watered by a considerable stream. The bed of the Chenab was elevated about 7,000 feet, and the valley was extremely mountainous, with beautiful forest, and the surrounding mountains being all tipped with snow, the scenery was extremely fine. As I had anticipated from the height of the snowy range which separated the valley from the lower Himalaya, I found the vegetation to resemble closely that of Kunawar. The trees were principally Pine, Deodar and *Pinus Gerardiana* being most abundant, with, in the lower and more shady forests, *Pavia*, *Corylus*, *Betula*, species of *Acer*, &c. An Oak, which I have never before seen but in Kunawar, was common, also the *Fothergilla*, which, with one or two other Kashmir plants not met with in Kunawar, proves the strong connection which exists in the vegetation of all these snow-surrounded valleys, and that the change which takes place is not sudden but gradual as one advances from east to west. It would be vain to attempt to enumerate the species which I collected in this beautiful valley. The vegetation was very luxuriant; and though many of the species were the same as those which I had

collected last year at Kunawar, yet from the different season I added many which were new to me, though I am inclined to think, and it is a good proof that the vegetation of N. W. Himalaya is now tolerably well known, hardly a single species which has not been described.

On the 19th of June I had attained an elevation of upwards of 10,500 feet in the valley which I was ascending. This was nearly the highest limit of trees, only Birches and Willows rising higher. The proximity of vast masses of snow seemed to have a marked effect on the climate, as Pine forests rise considerably higher than I have just mentioned on the outer ranges. Next day I got completely into the region of snow, though my camp, not far from the termination of an enormous glacier, was only elevated 11,300 feet. It was on a considerable plain, covered with small Willow trees and Birches partly in leaf, and partly, where still surrounded with snow, not showing a symptom of vegetation. On the 21st, continuing to ascend, I encamped on a small bare patch of ground by the side of a glacier, at an elevation of 14,500 feet, and on the 22nd I crossed the pass, the height of which I found to be upwards of 18,000 feet. Unfortunately the day was unfavourable, for it commenced snowing at day-break, and continued without intermission till the afternoon, so that I saw less of the grand scenery through which I was passing than I could have desired, and had not, as I had anticipated, an extensive view of surrounding countries from the top. The whole ascent was over the surface of a glacier, or over huge piles of snow-covered rocks by its side. The descent was also along glacier-filled valleys, and I was somewhat surprised to find that after the glacier in the valley by which I descended had terminated, another much larger, wider, and more gently sloping valley, which I afterwards joined, was filled with a prodigious mass of ice. In this second valley about half a mile beyond the end of the glacier, I encamped among huge stones at an elevation of 14,000 feet, and next day, continuing my journey, reached the western bank of the Zanskar river, running through an open valley generally quite barren, but here and there with small villages and cultivation. I had somehow taken it for granted that I should find a road along the Zanskar river to Le, since it joins the Indus about ten miles below that town; on enquiry, however, I found that its banks were in the lower part rocky and impracticable, and that the only good road

to Le joined the Indus at Kalatze, more than forty miles below that town. The journey therefore occupied me more time than I had anticipated, but as I crossed numerous mountain ranges I had more opportunity of seeing the country. I made four marches along the valley where it was open, and villages were plentiful; then turning to the right, traversed two high ridges, one upwards of 16,000 feet, and again descended to the Zanskar river, but only to cross it and strike into the mountains on the left bank. After crossing three ranges, the first 16,500 feet high, I reached the Indus, and followed its course to Le. At Le I remained a week, and then started for this place, by a different pass from that by which I travelled last year.

I must now try to give you some account of what I have seen since entering Thibet, and the comparative novelty of the country will I trust serve to excuse my dry and uninteresting narrative. I shall probably repeat a good deal of the contents of my last year's letters, for which also I must beg you to excuse me. The whole course of the Indus, north of Himalaya, is through a mountainous country, without any extensive table-land. The valley of the river diminishes of course in elevation as the stream advances to the sea, but the mountains throughout seem to have pretty much the same elevation, namely, from 18,000 to 20,000 feet, a few peaks rising a little higher. The main valley and some of the larger lateral ones have occasionally a width of two or three miles, but the latter are more frequently mere ravines, and often very narrow and precipitous ones. From between 12,000 and 13,000 feet down to about 6,000 (my lowest point on the Indus) both the main valley and those of the tributaries are occupied by more or less of a lacustrine deposit which is often of enormous thickness. It occasionally but rarely contains fresh-water shells, and appears to me to indicate that at a former period a lake extended throughout the whole interval between the elevations just mentioned, or from considerably above Le to forty miles or so below Iskardo. Of this extensive tract of country only a very small portion is cultivated, the whole of the mountains, and by far the greater portion of the valleys being absolutely desert. The mountains are almost universally tipped with snow, and their lower parts, where not rocky and precipitous, consist either of steep sloping shingle, or of undulating stony tracts. The climate is universally characterized by great dryness. The winters are severe;

but, especially in the more easterly tracts, little snow falls. In the lower parts of the Indus valley the quantity is considerable; and in the mountains south of the Indus it is great, and increases rapidly as the Indian Himalaya is approached. In summer, though light clouds are common and cloudy days occur now and then, very little rain is seen. It cannot be said that it never rains; but on the very few occasions on which I have observed rain to fall, the quantity has not exceeded a few drops,—not nearly sufficient to wet the ground. In the midst of these desert tracts, and in spite of the aridity of the climate, the industry of man has turned to useful purpose every available piece of ground. Wherever a level soil, in the least productive, and a sufficiency of water are found together, a village and cultivation are sure to be seen. As the heavens afford no rain, an ample supply of water is indispensably necessary, so that the existence of cultivated tracts may be ascribed to the circumstance that the mountains rise above the level of perpetual snow, the gradual melting of which during the summer months affords a supply of water for irrigation. The crops consist principally of Wheat and Barley, the latter only at high elevations. A little Buck-wheat, *Sinapis* for oil, Peas, and Beans, are grown; and at low levels and hot exposures, one or two Paniceous species are also to be seen.

In so desert a country you will not be surprised to hear that the natural vegetation is very scanty. I am not, however, at present able to form any estimate of the number of species which I have met with, but at a rude guess I do not think they exceed 500; and yet, entering the country as I did on the 22nd of June, at which time the early spring plants (*Primula*, *Gagea*, *Lloydia*, *Cruciferæ*) were in flower, I do not think that many have escaped me. The cultivated tracts round villages have a very luxuriant vegetation; and even on the barren tracts for the first fortnight a considerable number of species might be found; but lately everything has been dry and burnt up. The alpine flora commences about the elevation of 14,000 feet, and is principally confined to the edges of streams and places moistened by melting snow. The general features of the vegetation are entirely northern, and in the abundance of *Astragali* it approaches the Siberian flora. *Cruciferæ*, *Boragineæ*, *Labiatæ*, and *Chenopodiaceæ* are predominant Orders. In the cultivated fields *Vaccaria*, *Silene conica*, or *conoidea*, a

Cerastium, some *Polygona*, an *Elsholtzia*, *Hypecöum*, *Convolvulus arvensis*, *Lamium amplexicaule*, *Chenopodia*, and *Lycopsis* abound; and along the edges of the fields may be seen a *Mentha*, *Medicago*, *Melilotus*, *Nepeta*, a spinous-calyxed *Ballota*, a *Clematis*, *Cynoglossum*, *Heracleum*, *Capsella Bursa-Pastoris*, *Sisymbrium Sophia*, *Lepidium ruderale*, and a larger coarse species, a *Thalictrum*, a *Mulgedium*, a *Geranium*, and a large coarse yellow-flowered *Solanacea*, probably a new genus. In the grassy meadows the commonest genera are *Pedicularis*, *Gentiana*, *Potentilla*, *Astragalus*, *Ranunculus*, several species of each, *Plantago*, *Euphrasia* (*officinalis*), *Senecio*, *Allium*, *Galium*, *Taraxacum*, *Carum*, *Epilobium*, *Iris*, and *Gnaphalium*. Among marsh-plants may be mentioned *Triglochin*, *Hippuris*, *Veronica Anagallis*, *Ranunculus Cymbalaria*; *Glaux maritima*, and a white-flowered *Taraxacum* which abound where the soil is saline. The open barren tracts, as I have already said, were rather productive in early spring, at which time numerous *Cruciferæ*, *Boragineæ* (mostly *Echinosperma*) and *Astragali* occurred. The brilliant rose-coloured flowers of *Oxytropis chiliophylla* often covered large tracts. Several species of *Corydalis*, a *Euphorbia*, a *Matthiola*, *Nepeta floccosa*, *Ephedra*, *Capparis*, *Echinops*, *Guldenstädtia*, *Tribulus*, and several *Artemisiæ*, may also be mentioned. Shrubby vegetation is far from common, and only where there is a certain degree of moisture. Two *Myricariæ* are common along the banks of streams, especially on gravel, and to them in Nubra is added a *Tamarix*. *Hippophae* occurs everywhere near moisture, and *Rosa Webbiana* ventures even into the barren tracts. I am not aware whether this Rose has been introduced into England; but if not, it would (I think) be an acquisition, as it grows to a considerable height,—10 to 15 feet, forming large hemispherical tufts, completely covered with large red flowers. In one or two places I met with a yellow Rose, but only in gardens, and always with double flowers. Several Willows, a *Lycium*, a *Rhamnus*, and at least three *Loniceræ*, are the other shrubby plants: the latter extend up the lateral valleys towards the alpine region, and in these, in addition to numerous Willows, a Poplar with cordate leaves (*P. balsamifera*?) occasionally occurs. The alpine shrubs are only Willows and *Caragana versicolor*. I think I mentioned to you last year that I found an unknown tree, with leaves very variable in shape, on the banks of the Shayuk. This year I have again met with it, but, as before, without flower or

fruit: it agrees so exactly with a notice which I saw somewhere or other lately of *Populus Euphratica* of Olivier that I can hardly doubt its being that plant. If I am right, it is an interesting instance of the extension east of a west Asian plant. I have now only to mention the alpine vegetation, which is the most interesting of all, approaching very closely to that of Europe and Northern Asia. I can at present only mention two *Anemones* (apparently *A. patens* and *A. pratensis*), a Poppy, like *Papaver nudicaule*, a *Saxifraga*, very near, but I think, distinct from, *S. crassifolia*, a *Primula* somewhat resembling *P. Auricula*, a ficarioid *Ranunculus*, species of *Phaca*, *Oxytropis*, and *Astragalus*, *Biebersteinia odora*, *Lonicera hispida*, an *Androsace*, a *Veronica*, a *Thermopsis*, *Crassulaceæ*, and many *Cruciferæ*, of which, except *Draba*, I cannot at present give names. Of Rhubarb I have met with two species, one, I think, *Rheum Moorcroftianum*, the other is apparently undescribed.

I have thus run hurriedly over the principal forms of vegetation, since it is the only way I have at present (in the absence of accurate numerical facts) of giving an idea of the nature of the flora; but for many reasons only an imperfect idea is thus communicated; and in particular some of the most striking species not being referable to any described genus, I am obliged to omit all mention of them.

7th August.—To-morrow I start for the northern pass. I hope to be able to give you an account of my visit from Le, by the middle of September. I have been without letters from India for a very long time, and now I hardly hope to get them till my return to Le.

THOMAS THOMSON.

Extracts from the Private Letters of DR. J. D. HOOKER, *written during a Botanical Mission to* INDIA.

Continued from p. 56.

CALCUTTA TO DARJEELING IN SIKKIM-HIMALAYA.

I again sunk a thermometer, 3 feet 8 inches through an alluvium of such excessive tenacity, that the operation took eight natives four hours' labour, with a heavy iron jumper. In both this and another hole,

4 feet 8 inch, the temperature was at 72° at 10 P.M.; and on the following morning 71° 5′ in the deepest hole, and 70° in the shallower: that of the external air varied from 71° at 3 P.M., to 57° at daylight on the following morning. At the latter time I took the temperature of the earth near the surface, which showed,

Surface . . .	53°
1 inch . .	57
2 „ . . .	58
4 „ . . .	62
7 „ . . .	64

Elevation of Nourungabad, 535 feet.

Feb., 14th.—At daylight marched for Barroon, on the banks of the Soane, crossing a deep stream by a pretty suspension-bridge, the approach to which, straight as an arrow, reminded me of Hammersmith bridge from Barnes. The piers were visible two miles off, so level is the road.

Barroon stands on the alluvial plains, just above the Soane, here three miles across, its nearly dry bed being a desert of sand, resembling a vast arm of the sea when the tide is out. The river-banks are very barren, no trees near, and but very few in the distance. The houses were scarcely visible on the opposite bank, and behind these the Kymaor range rises, for so the continuation of that Vindhya range is called, which I previously mentioned to you as running from Chunar on the Ganges to the Gulf of Cambay, parallel to the range I had crossed.

The Soane is a classical river, being now satisfactorily identified with the Eramoboas of the ancients.*

Barroon is 557 feet above the sea, showing a gradual descent since leaving Dunwah. Benares on the Ganges, somewhat further above its junction with the Soane than Barroon, is said to be 800 feet above the sea, exhibiting a much more rapid fall in this river.

Walked along the river-banks, botanizing. The alluvium is cut into a cliff, ten or twelve feet above the bed of the river, and against it the sand is blown in naked *dunes*. The baked alluvium was very barren,

* Hodgson tells me that the etymology of Eramoboas is undoubtedly Hierrinia bahu (Sanskrit), the golden-armed. Sona is also the Sanskrit for *gold*. I saw no traces of the precious metal in the sand, nor any mineral more remarkable than mica, and the agates (Soane pebbles), for which the stream is celebrated.

covered with *Rhamneæ*, *Olax*, and a tall *Sida* (?), which I had not seen elsewhere. A *Menispermum* was very abundant.

At 2 P.M., the surface sand was heated to 110° where sheltered from the wind, and 104° in the broad bed of the river. Finding the fresh juice of *Calotropis* to be only at 72°, I was curious to ascertain at what depth this temperature was to be obtained in the sand of the river-bed, where the plant grew.

Surface . . .	104° 5′
1 inch . .	102
2 „ . . .	94
2½ „ . .	90
3½ „ . . .	85 compact.
8 „ . .	73 wet.
15 „ . . .	72 ditto.

The alluvium of the banks communicated heat much better than the sand, but was so very hard that I had difficulty in taking the following:—

Surface .	104° (colour light grey).	
2½ inch. . .	93	
5 „ .	88	In sand 78°.

The power this plant exercises of maintaining a low temperature of 72°, though the main portion that is subterraneous is surrounded by a soil heated between 90 and 100°, is very remarkable, and no doubt proximately due to the rapidity of evaporation from the foliage, and consequent activity in the circulation. Its exposed leaves maintained a temperature of 80°, nearly 25° lower than the similarly exposed sand and alluvium. On the same night the leaves were cooled down to 54°, when the sand had cooled to 51°. Before daylight the following morning the sand had cooled to 43, and the leaves of the *Calotropis* to 45° 5′.

I omitted to observed the temperature of the sap at daylight the following morning; but the sand at the same depth (fifteen inches) as that on which its temperature and that of the plant agreed at mid-day, was 68°. And assuming this to be the heat of the plant, we find that the leaves are heated by solar radiation during the day 8°, and cooled by nocturnal radiation, 22° 5′.

Mr. Theobald (my companion in this and many other rambles) pulled a lizard from a hole in the bank. Its throat was mottled with

scales of brown and yellow. Three ticks had fastened on it, each of a size covering three or four scales: the first was yellow, corresponding with the yellow colour of the animal's belly, where it lodged, the second brown, from the head; but the third, which was clinging to the parti-coloured scales of the neck, had its body party-coloured, the hues corresponding with the individual scale it covered. The adaptation of the two first specimens in colour to the parts to which they adhered, is sufficiently remarkable; but the third case was passing strange.

Here I sank a thermometer twenty-eight inches, in a soil as hard as iron. The temperature at 9 P.M., 70°; 11 P.M., 72°, and on the following morning, 5½ A.M., 68° 5′. Can this increase between 9 and 11 be owing to the slow transmission of the solar heat of the previous day downwards? The thermometer was carefully guarded with flannel; and the corresponding temperature of the air in the shade was, at 9 P.M., 62°, and at 5½ A.M., 53° 5′.

Between 9 and 11½ P.M., the sky was illumined by a magnificent aurora, which I need not trouble you with describing again.

At 9, I went down to the bed of the river, to see at what rate the sand was parting with its heat about my *Calotropis*; and as I tried the same at dawn of the following morning, I shall give you them both together.

	9 P.M.		½ past 5 A.M.	
Surface	51°		43° 5′	
1½ inch.	60		50	
3½ „	67		57 5′	
8 „	70 5′		67	
10 „	70	12 inch.	67 5′	Sand wet.
		16 „	68	ditto.

Feb. 15th.—Our passage through the Soane sands was very tedious, though accomplished in excellent style, the elephants pushing forward the heavy waggons of mining tools with their foreheads. The wheels were sometimes buried to the axles in sand, and the bullocks found themselves rather in the way than otherwise. The body of water, over which we ferried, was not above eighty yards wide, and nearer to the opposite bank. In the rains, when the whole space of three miles is one roaring stream, ten or twelve feet deep, this river must present an imposing spectacle.

I walked across (except the watery bit) observing the sand-waves, all ranged in one direction, perpendicular to that of the prevailing wind, accurately representing the undulations of the ocean, as seen from a mast-head or high cliff. As the sand was finer or coarser, so did the surface resemble a rippling bay, or an ocean-swell. The progressive motion of the waves was curious, and caused by the lighter particles being blown over the ridges and filling up the hollow to lee-ward.

There were a few islets in the sand, a kind of Oases of laminated mud and clay, the laminæ no thicker than paper. These were at once denizened by the *Calotropis*, *Argemone*, *Tamarix*, *Gnaphalium luteo-album* and two other species, a *Dock*, a *Cyperus*, and *Saccharum*. Some large spots were green with Wheat and Barley-crops, both suffering grievously from the smut.

The village of Dearee is close to the shore where we encamped: it also marks the termination of the Vindhya hills, here called Kymaor, along whose S.E. bases our course now lies, leaving the grand trunk-road for a seldom visited country.

Feb. 16th.—Marched (south) up the Soane to the village of Tilotho, a most lovely spot, about five miles from the foot of the hills, and situated in a superb grove or tope of Mango, Banyan, Peepul, Tamarind, and *Bassia*. There are also various tombs and temples in the grove, close to one of which we encamped. The country is rich, and well-cultivated with Wheat, Barley, and Oats (all much diseased), Indigo, Cotton, Sugar-Cane, *Carthamus*, Poppy, Gram (*Ervum Lens*), Dhal (*Cajana*), Tares and Vetch, and Castor-oil. Mahoua yields gum copiously. The *Zizyphi* are large, twelve to fifteen feet high, forming round bushes. *Cuscuta* throws a gamboge-yellow web over the tallest trees, and a beautiful purple-flowered *Capparis* sprawls on the hedges. A large *Saccharum* forms immense tufts, now past flower: its culms are used for various purposes (I have specimens of manufacture), especially for fans to winnow the Indigo seeds. The *Phœnix* or Toddy Palm and *Borassus* are very abundant and tall: all have a pot hung under the crown. The natives climb these trunks with a hoop or cord round the body and both ancles, and a bottle-gourd or other vessel hanging round the neck to receive the juice from the stock-bottle, in this aerial wine-cellar. So lofty were these Palms, that the climbers, as they paused in their ascent to gaze with wonder at our large retinue, resem-

bled monkeys rather than men. Both Palms yield a toddy, but that from the *Phœnix* alone ferments, and is distilled.

Walked to the hills, over a dead level cultivated country, interspersed with occasional belts of low wood; in which the pensile nests of the weaver-bird were abundant, but generally hanging out of reach, in a prickly *Acacia*.

The hills here present a straight precipitous wall of stratified sandstone, very much like the rocks at the Cape of Good Hope, with occasionally a shallow valley, and a slope of débris at the base, densely clothed with dry jungle. The cliffs are about 1,000 feet high, and the plants similar to those at the foot of Paras-Nath, but stunted: I climbed to the top, the latter part by stairs or ledges of sandstone, in which a withered *Selaginella* and dried *Riccia* grew. The summit was clothed with long grass, trees of *Diospyros* and *Terminalia*, and here and there the *Boswellia*. On the precipitous rocks, the curious white-barked *Sterculia* "flung its arms abroad," leafless, and looking as if blasted by lightning.

During my absence I employed eight coolies to dig a hole, as deep as they could, with an iron jumper; but after eight hours they had only sunk four feet six inches. The thermometer placed in it, stood at 76° that night, and the following morning, the corresponding temperature of air being 64° 5′ and 60° 5′.

Feb. 17th.—Marched to Rotasghur, a spur of the Vindhya, overhanging the Soane. As we proceeded, the steep escarpment of rock approaches the river, and a seam of limestone is seen protruding below the sandstone, on a level with the plains through which the river runs. Though the overlying strata of sandstone are quite horizontal, those of limestone dip to the N.W. Passing between the river and a curious, conical, detached, dry hill of the limestone, capped with a little block of sandstone, the spur of Rotas broke suddenly on the view, and very grand it was, realizing quite my anticipations of the position of these hill-forts of India. To the left of the spur, the valley of the Soane winds, with low-wooded hills on its opposite bank, and a higher range, connected with that of Behar, in the distance. To the right, the hills sweep round, forming an immense and very beautifully wooded amphitheatre, about four miles deep, apparently bounded, like the valley of Rasselas, with a continuation of the escarpment. At the foot of the crowned spur, was the village of Akbarpore, where we encamped, occu-

pying a pretty undulating ground of limestone hills; amongst which several streams flowed from the amphitheatre to the Soane.

During my two days' stay here, I had the advantage of Mr. Davis's society, a gentleman to whom I am indebted for a great deal of excellent information, and whom I heartily wished we could have induced to join our march up the Soane. As it wás, he kindly became our guide in our rambles hereabouts, and there was not a subject connected with the place, upon which he could not enlighten me. Such a companion is rare in the Indian jungles, indeed, I may say, anywhere.

At noon, we started to ascend to the palace, on the top of the spur, Mr. Haddon, my old companion of Paras-Nath, I regret to say, was suffering under an attack of fever, and could not accompany us. On the way we passed a beautiful well, with a flight of steps to the bottom. This was about twelve feet square, and sixty deep, with a fine Fig-tree growing from out the stone-work of the mouth, and shading the deep profound. The descent was by an easy flight of steps, covered with weeds, luxuriant *Acanthaceæ*, and herbaceous *Compositæ*: one or two of these I had previously only found at the top of Paras-Nath, and subsequently on the same day on the top of Rotas, the coolness of the well and the moisture no doubt compensating for the altitude. At the bottom, the temperature was 74°, 6° below the air at the surface: the water 60°, was deliciously cool. The roots of the *Ficus* formed a singular feature, enveloping two surface-walls of the well, with a beautiful lace-work of stout fibres, which at the high-water mark (rainy season, when the well is fullest) suddenly divided into thousands of brushes of roots, descending through the water to the earth below. It was really a pretty place; whether you looked up the well to the green branching Fig overhead, or along the vista of flowering herbs and climbing plants which choked the steps, to the burning sky above.

The ascent of Rotas is over the dry scrub and brushwood of the limestone (now fossiliferous) to a crest, where are rude defences. The limestone is succeded by the sandstone cliff, cut into steps, which lead from ledge to ledge of the strata, and up to a gap, well guarded with walls and an arch-way of solid masonry. Through this you pass onward to the flat summit of the Kymaon hills, covered with grass and low sparse forest, intersected by paths in all directions. The ascent is about 1,200 feet, a long pull in the blazing sun (of February!). The turf consists chiefly of Spear-Grass and *Nardus* (*ναρδος*), which yields a

favourite fragrant oil, much used in domestic medicine all over India, being, I am told, of undeniable efficacy in curing rheumatisms. The trees are of the kind mentioned before, especially the *Olibanum*, *Diospyros*, and *Terminalia*. The latter (*Vatica robusta*) is rare, from being universally cut down. The curious *Hymenodyction thyrsiflorum* grows here, now a leafless tree, with seeds. A pretty summer-house, octagonal, and with a roof supported by pillars, occupies one of the highest parts of the plateau, which is called 1,485 feet above the Soane, and commands a superb view of the scenery before described. From this to the palace is a walk of two or three miles, through the woods. The buildings are very extensive, and though now ruinous, they bear evidence of great beauty in the architecture: high galleries, supported by slender columns, long cool arcades, screened squares and terraced walks, are the principal features. The rooms open out upon flat roofs, affording superb views of the long, endless table-land on one side, and a sheer precipice of 1,000 feet on the other, with the Soane, the amphitheatre of hills, and the village of Akbarpore.

This and Bidjegurt, higher up the Soane, were among the last forts taken by the English, and this was also the last of those wrested from Baber in 1542. Some of the rooms are still habitable; but the greater part are ruinous, and covered with weeds and wild-flowers, and the naturalized garden-plants of the adjoining shrubberies, the *Nyctanthes* and *Guettarda*, with *Vitex Negundo*, *Hibiscus Abelmoschus*, *Abutilon Indicum*, *Physalis*, *Justicia Adhatoda*, and other *Acanthaceæ*, and above all, the little yellow-flowered *Linaria ramosissima*, crawling like the English *L. Cymbalaria*, over every ruined wall, just as we see the walls of our old English castles, harbouring to the last stone the plants their old masters fostered.

On the limestone walls several species of crustaceous Lichens abounded. In the old dark stables I observed that the soil was covered with a copious most evanescent efflorescence, like soap-suds scattered about; of which earth I send specimens, for the salt was so light, that it was impossible even to lift it.

I made Rotas palace to be 1,759 feet above the sea, or 1,100 feet above the village of Akbarpore; so that the table-land is here only fifty feet higher than that I had crossed on the grand trunk-road before descending at the Dunwah pass. Its mean temperature, Mr. Davis informs me, is about 10° below that of the valley below; but though

so cool, it is not exempt from agues after the rains. The extremes of temperature are less marked up here than below, where the valley becomes excessively heated, and where the hot winds sometimes last for a week, blowing in furious gusts. The climate of the whole neighbourhood has changed materially within these twenty years, especially the fall of rain, which has much diminished in consequence of felling the forests. Even within six years, the hail-storms are far less frequent and violent. The air on the hills is highly electrical, owing, no doubt, to the dryness of the atmosphere, to which the frequent formation of hail-storms may also be due.

The Zoology of these regions is tolerably copious; but little is known of the natural history of a great part of the plateau. A native tribe, addicted to human sacrifices, is talked of. Tigers are far from unfrequent, and bears are numerous. They have, besides, the leopard, panther, Viverrine cat, and civet; and of the dog tribe, the pariah, jackall, fox, and wild dog, called Koa. Deer are very abundant, of six or seven species. A small alligator inhabits the hill-streams: it is a very different animal from either of the Soane species, and Mr. Davis has kindly promised to procure me a skin of it.

On the descent we examined several instances of ripple-mark (fossil waves' foot-steps) in the sandstone. They resembled the fluting of the *Sigillaria* stems in the coal-measures, and occurring as they do here, in sandstone, a little above great beds of limestone, had been taken for such, and considered to be indicative of coal.

On the following day we visited Raj-ghat, a steep gulley or pass, leading through the cliff to Rotas palace, a little higher up the river. We took the elephants to the mouth of the glen, picking up Mr. Davis on our way, who had taken his *usual* before-breakfast walk, from Akbarpore to the top of Rotas, and down by the Raj-ghat pass. Dismounting, we followed a stream, abounding in small fish and insects (*Dytisci* and *Gyrini*) through a dense jungle to the foot of the cliffs, where there are indications of coal. The woods were full of monkeys. Amongst other plants I found *Murraya exotica*, but scarce. Though the jungle is very dense, the woods were dry and contain no Palms, *Aroideæ*, Peppers, *Orchideæ*, or Ferns.

BOTANICAL INFORMATION.

Linnæan Society, Feb. 6th, 1849.

Edward Forster, Esq.,* Vice-President, F.R.S., in the Chair.

A series of specimens of the Natural Order *Cycadeæ* was exhibited, and a portion of them presented to the Society, by James Yates, Esq., F.R.S., F.L.S., &c.

In his catalogue of these specimens the author followed the arrangement and adopted the names of Lehmann, Miquel, and Brongniart. The specimens were accompanied by drawings, and included leaves and cones, both male and female, of the following species, viz.: *Cycas revoluta*, *Macrozamia spiralis*, *Encephalartus cycadifolius*, *E. Lehmanni*, *E. brachyphyllus*, *E. Altensteinii*, *E. Caffer*, *E. horridus*, *E. nanus*, *Zamia muricata*, *Z. furfuracea* (?), *Z. integrifolia* (?), *Z. media* (?), and *Ceratozamia Mexicana*. In the course of his communication, Mr. Yates noticed the plants which have lately flowered in England, and gave a more detailed description of a female *E. Caffer*, which lately produced a large cone at Chatsworth, and from which he was enabled to obtain casts, exhibiting the flower-bud † in a very advanced state, and a single scale of the cone with the fruit upon it in a mature state. Observations were also made upon the following points: the importance of the vernation in distinguishing both genera and species, the changes to be observed in the leaves of the same plant at different ages, the longevity of the leaves; their articulation, the comparative length of time required by male and female flowers in coming to maturity; the way in which the pollen is brought into contact with the summits of the seeds; and the want of agreement among botanists in the names given to the genera and species.

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* It is with much regret that we have to announce the sudden death, at the age of 84, of this much esteemed member of the Linnæan Society, whose strength and eminent zeal for its interests enabled him to attend the evening meetings with punctuality to the close of his life.

† An accurate model of this flower-bud, and a most beautifully executed one, of the scale and fruit, have been liberally presented by Mr. Yates to the Museum of the Royal Gardens of Kew.

Botanical Society, Feb. 2nd, 1849.

John Reynolds, Esq., Treasurer, in the Chair.

Various donations to the Library were announced, and six new members elected.

British Plants had been received from Mr. Hewett Watson, Mr. A. Henfrey, Mr. G. Reece, Dr. Bidwell, Mr. F. J. A. Hort, The Reverend John Bigge, Mr. G. Francis, Mr. G. Maw, The Reverend W. R. Crotch, Mr. A. H. Balfour, Mr. G. Lawson, and Miss M. Beevor; and Foreign Plants from Mr. G. Francis.

Several specimens from Mr. Hewett Watson, Mr. F. Barham, Mr W. H. Purchas, and Mr. S. P. Woodward, in illustration of recently distinguished species, curious varieties, &c., were exhibited. Among them were examples of *Hieracium alpinum*, with the scapes branched and leafy, showing a transition to the section of stem-producing species. Also a curious example of *Carex atrata*, in which the character and position of the flower spikes were widely different from their ordinary condition, giving to the specimen, at first sight, an appearance similar to that of a very luxuriant *C. rigida*; the terminal spike being almost entirely male, and cylindrical, four inferior spikes of female flowers, with a few males interspersed, cylindrical, or oblong, erect, and placed rather distantly one below another, the lowest about three inches beneath the terminal male spike. The specimen had grown in Mr. Watson's garden on a root of *Carex atrata* brought from the Grampians a few years ago.

Mr. I. T. Mackay.

We are glad to learn that Trinity College, Dublin, has so duly appreciated the services rendered to Botany and Horticulture by the able Curator of their Botanic Garden, Mr. I. T. Mackay, that they have unanimously conferred upon him the degree of LL.D.

Notes on Californian Plants.

Much to the credit of the American government, instructions are given in their Exploratory journeys, for collecting objects of Natural History. This has been eminently the case with their various expeditions to the westward of the Rocky mountains, as we have had occasion to observe when alluding to Fremont's journeys.

A work which we have just seen, published at New York, 1848, by Capt. Emory, entitled Notes on a Military Reconnoissance from Fort Leavenworth, in Missouri, to San Diego in California, including parts of Arkansas, del Norte, and Gila rivers, is a confirmation of the spirit of discovery fostered by persons in authority in the United States. Besides a very extensive and valuable map of the route, this volume is accompanied by a great number of excellent views of the scenery of the country (exhibiting some vegetable features), an appendix by Dr. Torrey on the plants collected, with twelve plates of new species, and another supplement by Dr. Engelmann on the *Cacteæ* observed on the route, together with two plates exhibiting several species, but along so minute a scale, and with no attention to botanical character, that they are of little or no value.

The journey occupied six months. From the 27th of June to July the 11th, the party traversed the country between Fort Leavenworth and the head of the Arkansas, a rich prairie between the thirty-ninth and thirty-eighth parallels of latitude. Here trees are only seen along the margins of streams, and the general appearance of the country is that "of vast rolling fields enclosed with colossal hedges." The trees are Ash, Burr-Oak, black Wallnut, Chestnut Oak, black Oak, long-leaved Willow, Sycamore, Buck-eye, American Elm, Pig-nut Hickory, Hack-berry, and Sumach. Towards the west, on approaching the 99th meridian of longitude, the growth along the streams becomes almost exclusively Cotton-wood (*Populus Canadensis*). Thence the travellers entered the valley of the Arkansas, and the country soon became an arid barren waste, indicated by the occurrence of *Cacti* and spinous plants, the first of which were seen in longitude 98°. There, too, Buffalo-grass began to appear (*Sesleria? dactyloides*, Nutt.), so called because it is the chief fodder of the buffalo during the season that it flourishes. On the 1st of August they crossed the plain to the

Raton monntain, 7,000 feet above the sea, between lat. 38° and 36°; then the tributaries of the Canadian river, and ascending the great ridge between that river and the Del Norte, reached Santa Fé in lat. 35° 41′, 6,580 feet above the level of the sea. The route continued across the great dividing ridge between the Del Norte and the Gila river, at an elevation of 6,000 feet; then by the Colorado, and across the great desert of drifting sand to Cariso Creek. On the 28th of November they ascended the Cordilleras of California (the continuation south of which forms the peninsula of Lower California), reaching the highest point of the route, December the 5th, 3,000 feet above the sea, and as many below the overhanging peaks; whence they descended to San Diego on the coast of the Pacific, in lat. 32° 45′.

During this route, assuredly the most remarkable plants met with were the *Cacti*, and of them the most striking is called by Dr. Engelmann *Cereus giganteus*. It is represented in several of the views, sometimes simple, and sometimes branched, and is described as being from twenty-five to sixty feet in height, and two to six feet in circumference. The figures assuredly represent the well-known *Cereus senilis* of which the Royal Gardens of Kew boast two specimens fourteen to sixteen feet, and they did possess one, which died, eighteen feet, in height. Our plants are, however, unbranched. A beautiful, and we can well conceive a most characteristic plate of a gigantic branched one is given by the artist at p. 94, with a horseman at the foot, who looks quite a pigmy in proportion to it. We searched in vain for a figure or description of its flowering state; but we are assured by a correspondent in Mexico, from whom we received our specimens of *C. senilis*, that this species, when large enough and old enough to bear flowers, is crowned with that enormous woolly mass, which many of our readers will recollect as having been formerly in the possession of Mr. Lambert (after his death purchased by the British Museum), and known under the name of the "Muff-Cactus." If this statement be correct, and we have no reason to doubt it, this portion of the plant is analogous to the cushion-like crown upon the *Melocactus communis*, and that upon the *Echinocactus Visnaga*,—a receptacle, as it were, for the flowers.

Another exceedingly interesting plate in this book is "a group of plants exhibiting the vegetation on the Gila." They consist of *Cereus*

senilis (unbranched) and other *Cacteæ*, *Larrea Mexicana*, &c., but the individual kinds are not clearly indicated in the text. *Larrea Mexicana* is the "Creosote Plant," figured by Moricand, Pl. Nov. p. 48, or *Iodeondo* of the New Mexicans, used externally for rheumatism. It has a powerful smell: no animal feeds upon it, and it is even useless as fuel, as it can scarcely be made to burn.

Several new species of plants are described by Dr. Torrey. Among the more remarkable we may mention the little-known *Fallugia paradoxa* of Endlicher (*Sieversia paradoxa*, Don, in Linn. Trans. vol. xiv. p. 376. t. 22). We possess what we consider the same plant in Fendler's Plantæ Novo-Mexicanæ, n. 193; but there the flowers are about as large as those of our Dog-rose. In Don's figure they are rather more than half that size; while in Dr. Torrey's plate they are not so large as those of *Potentilla reptans*. Dr. Torrey queries if it be not the *Geum dryadoides* of De Candolle: it sufficiently accords with the brief character; and *G. cercocarpoides* does not appear to differ either.*

The *Compositæ* afford two new genera, *Hymenoclea* and *Baileya* (Harv.). A new Ash (*Fraxinus velutina*) was found between the Del Norte and the Gila; and two new *Eriogona*. *Quercus Emoryi* is a new Oak from the same locality, and there are some new grasses.

Deodar (*Cedrus Deodara*).

A friend had written to me to say that the name *Deodar*, though applied in Europe to the *Cedar* of the *Himalaya*, is incorrectly given to this tree, for that it belongs to the *Cypress* of the Himalaya (*Cupressus torulosa*). On enquiring the correctness of this statement of my enterprising friend Dr. Thomas Thomson, he replies from Kashmir, in a letter dated Oct. 7th, 1848 (the latest intelligence that has been received from him) to the following effect:—

* A still more remarkable shrubby Rosaceous (*Dryadeous*) plant than this, will be described by Mr. Bentham from Hartweg's Californian plants, n. 1712, the most singular plant perhaps of that collection. Its leaves are decompoundly pinnate with leaflets exceedingly small and resembling those of *Azolla*.

"Your correspondent who says that the *Deodar* of the natives is not *Cedrus Deodara*, is partly right and partly wrong. The subject has been well elucidated by Madden, in a paper published in a semi-medical Journal, which you have probably not seen. *Deodara* means simply *God-given*, or the *gift of God*, and is applied to more than one tree; but in Kamaon (whence Roxburgh obtained the tree) as well as in Kashmir, *only* to *Cedrus Deodara*. At Simla, where your correspondent probably received his information, the Deodar is called *Kelú* (*Kelon*, Royle, p. 350), and the sacred name, according to Madden, is given to *Cupressus torulosa*. At Massuri the tree is not found; that place being on the outermost range, to which apparently *Cedrus Deodara* never extends. In the valley of the Chenab I found that the name *Kelú* was that known to the people."

Travellers who have seen the *Deodar* in its wild and natural state, do not appear to be yet agreed as to its identity, or otherwise, with the Cedar of Lebanon. Untravelled botanists are not competent to decide; because, in a young state, it is notorious how variable are the plants of the Pine tribe generally; and perfect specimens of Deodar probably scarcely exist in Herbaria. In colour and aspect and ramification the Cedars of Lebanon, when large, do exhibit considerable discrepancies. Some have even considered the kind that grows on Mount Atlas different from the true Cedar of Lebanon; but that opinion does not seem to gain ground. If the Cedar extends from Mount Atlas in the west to Lebanon in Syria, and thence, according to authors, to the Mounts Amanus and Taurus; and if Ledebour received information of (though he did not see) a forest of Cedars at Tschetschulicha at an elevation of 6,540 feet of elevation, in the Altai mountains, it brings us to no unreasonable distance from the western portion of the Himalaya mountains, and to Ladakh, where Moorcroft speaks of two varieties of the Deodar growing, the one called *Shinlik*, the other *Christa rooroo*:—and we know that there is a great similarity between the vegetation of the Altai and the Himalaya. Our valued friend, Capt. Munro, who has been much among the Deodars of the latter country, expressed his opinion that the *Deodar* is not specifically distinct from the Cedar of Lebanon; and Dr. Thomas Thomson, in a former letter from Simla, thus writes:—

"This place averages 7,500 feet above the level of the sea. The top

of Jako, the highest hill is, I believe, 8,300 feet. The vegetation scarcely differs at all from that of the same elevation in Kamaon. It is about forty miles from the plains, and the *Deodar* is very plentiful here and ornamental. I see that it is still a matter of doubt whether the Indian Cedar differs from that of Lebanon. Assuredly it is here very variable in its mode of growth; tall and thin, with slightly declining branches in its natural state, but often, by the destruction of the leading shoot, dividing into two or three, parallel, erect stems, each resembling a single tree, and sometimes not six inches apart from one another." Certain it is that no botanist, in describing the trees, has given clear and distinctive specific characters. If we take those of individuals who, from treating of the *Coniferæ* at large, might be considered competent to the task, we shall find little to depend upon. Mr. Lambert's specific distinctions are thus stated:—

Pinus *Cedrus*; "foliis fasciculatis perennantibus, strobilis ovatis obtusis erectis, squamis depressis erectis rotundatis."

Pinus *Deodara*; "foliis fasciculatis perennantibus acutis triquetris rigidis, strobilis geminis ovalibus obtusis erectis, squamis adpressis."

Endlicher's characters (*Synopsis Coniferarum*) are—

Pinus *Cedrus*, "Libani, ramis erectis, foliis arrectis densis, strobili squamis basi sub angulo recto inflexis."

Pinus *Deodara*, "Indica, ramis pendulis, foliis patentibus laxiusculis, strobili squamis basi haud inflexis."

I incline to the opinion that if the *Deodar* of the Himalaya had been discovered in a locality nearer to the Cedar of Lebanon, botanists would have considered it only a variety of that classical tree; and tracing it, as we can do, according to the testimony of travellers, from Mount Atlas in the west to the chain of Taurus and Altai in the east, we may fairly infer that the same species reaches the Himalaya range, and stretches as far as Kamaon.

Decades of Fungi: *by the* Rev. M. J. Berkeley, M.A., F.L.S.

Decades XXI. *and* XXII.

North and South Carolina Fungi; by the Rev. M. J. Berkeley and the Rev. M. A. Curtis.

The Fungi included in these and some succeeding Decades were collected in the two Carolinas by the Rev. M. A. Curtis, in the neighbourhood of Hillsborough and Society Hill, and on the Santee River, South Carolina, by Mr. H. W. Ravenel. A vast quantity of European forms and many of the rarest species occur in their extensive collections, amounting to nearly 2,000 numbers, and amongst them others belonging to the Floras of Cuba, Guiana, and Central America. There are also a multitude of undescribed species, exhibiting very interesting types, but seldom new genera. Great attention has lately been paid to American Fungi, and the practised eye of the Mycologist of Prague, now sojourning at Neu Braunfels in Texas, will without doubt come in aid of the extensive labours of Schweinitz and more recent observers to give us as intimate an acquaintance with the American forms of this frequently neglected tribe, as we now possess of European species. The descriptions have been drawn up in great measure from notes made when the individuals were gathered, which have proved most useful, and have prevented some errors which are almost inseparable from mere Herbarium specimens, and, happily, many of the most puzzling species have been collected in a variety of states, so as to enable us to combine forms which at first seemed widely different, and consequently to prevent the proposition of some spurious species.

* *Agaricus aspratus*, Berk. Curt. No. 1478.

This exquisite species, which in Ceylon occurs on the ground in shady places, is found in the swamps of South Carolina.

201. *Agaricus* (Amanita) *agglutinatus*, Berk. and Curt.; pileo ex hemispherico plano viscido e volva areolato, margine sulcato; stipite curto solido; lamellis latis liberis rotundatis. Curt., No. 1322.

Hab. On the ground in sandy woods. Aug., 1847. South Carolina.

White, pileus 1–2 inches broad, hemispherical, becoming plane, viscid, scaly from the remains of the volva; margin thin, sulcate. Stem ½–1½ inch high, two lines thick, solid, enlarged at the apex, bulbous at the base, furnished with a volva whose margin is free. Ring

wanting. Gills broad, ventricose, rounded behind and free. Spores white, elliptic.

Resembling some of the dwarf forms of *Ag. vaginatus*, but at once distinguished by its solid stem and decidedly viscid, areolato-squamose pileus.

202. *A.* (Psalliota) *Achimenes*, Berk. and Curt.; pileo plano glabro nitido verrucis exasperato; stipite floccoso-farcto; lamellis liberis ex albido cinereis. Curt. No. 1708.

HAB. On the ground, near the Santee River, South Carolina. June, 1847.

Solitary. Pileus 4–6 inches broad, pallid or ochroleucous, plane, smooth, like kid leather, but studded with warty excrescences especially towards the centre. Stem 4–6 inches high, ¼ of an inch or more thick, white, stuffed with floccose fibres, furnished towards the apex with a large deflexed ring. Gills broad, crowded at first, whitish, then cinereous or lead-coloured, free. Spores brownish.

A splendid species, allied to *Ag. fabaceus*, Berk., but differing in its paler spores, warty pileus, ample ring, &c.

203. *A.* (Pluteus) *Curtisii*, Berk., MSS.; pileo erugi viscido hepatico; stipite solido glabro albo; lamellis liberis ex albo roseis. Curt., No. 1523.

HAB. Beneath fallen trunks in woods. South Carolina. Oct.

Pileus 2 inches or more broad, convex, dark liver brown, smooth, not wrinkled, viscid when moist, with a satiny lustre when dry. Stem 2½ inches high, ⅓ of an inch thick, smooth, white, solid, rather incrassated at the base. Gills at first white, free, rounded behind, rather broad, thin, crowded, at length rose-coloured. Odour disagreeable, though not strong.

Allied to *Ag. leoninus*, but abundantly distinct from all the species in its section, and remarkable for its smooth, viscid, liver-coloured pileus.

* *Paxillus flavidus*, Berk.—*Ag. rhodoxanthus*, Schwein.

The species occurs in Lower Carolina as well as in the more northern states.

204. *Hygrophorus mucilaginosus*, Berk. and Curt.; pileo valde mucilaginoso lætecolori convexo demum plano striato; stipite fragili subconcolori fistuloso; lamellis decurrentibus crassis carneis. Curt., No. 1258.

HAB. In swamps. South Carolina. July, 1847.

Pileus $\frac{1}{2}$–$\frac{3}{4}$ inch broad, convex, at length plane, striate, very mucilaginous, of a bright pale reddish yellow, darker in the centre. Stem 1–2 inches high, a line or more thick, composed of longitudinal fibres, brittle, fistulose, subpellucid, pale yellow or carneous. Gills subdecurrent, unequal, distant, fleshy, flesh-coloured.

Allied to *H. cantharellus*, Fr. The habit is that of some varieties of *Ag. umbelliferus*. It is at once distinguished by its very mucilaginous pileus and thick gills from *H. cantharellus*, and by its brittle stem from *H. lætus*.

205. *H. luridus*, Berk. and Curt.; pileo campanulato umbonato pallide fusco viscosissimo; margine striato crenato; stipite fistuloso concolori; lamellis crassis venoso-convexis adnexis albis. Curt. No. 1256.

Hab. In low swampy places. South Carolina. July, 1847.

Pileus $\frac{3}{4}$ of an inch broad, campanulate, umbonate, very viscid, pale brown, darker in the centre; margin striate, crenate. Stem $1\frac{1}{2}$ inch high, one line or more thick, pale brown like the pileus, fistulose, composed of longitudinal fibres. Gills white, ventricose, shortly adnate, thick, connected by veins.

Not very closely allied to any described, except perhaps to *H. unguinosus*, with which it agrees closely in technical characters, but is very different in habit. *H. unguinosus* is a much larger and more robust species.

206. *Marasmius opacus*, Berk. and Curt.; gracilis; pileo convexo ruguloso opaco pulverulento albido; stipite insititio elongato pulverulento-subfurfuraceo pallido; lamellis ventricosis distantibus adnexis. Curt., No. 1241.

Hab. On leaves and twigs. South Carolina. June, 1847.

Pileus 2 lines across, convex, or slightly depressed round a central umbo, opake, pulverulent, dirty white, scarcely striate or sulcate. Stem 1–$1\frac{1}{2}$ inch high, $\frac{1}{3}$ of a line thick, of the same colour with the pileus, pulverulent, and, towards the base, furfuraceous. Gills ventricose, moderately broad, slightly adnate, with the interstices nearly even.

This species is nearly allied to *M. ramealis*, but, like *M. synodicus*, is far more elongated. It does not appear to be particularly gregarious. The stem is not darker at the base, the gills are ventricose and moderately broad. From *M. candidus* it differs clearly in its opake pileus, and from *M. synodicus* in its rather broad, not vein-like, gills.

207. *M. pithyophilus*, Berk. and Curt.; pileo e convexo plano-umbilicato sulcato-striato brunneolo; stipite insititio solido concolore pulverulento-furfuraceo; lamellis fusco-carneis subdecurrentibus. Curt. No. 1327.

HAB. On large pine leaves. South Carolina. July, 1847.

Pileus $\frac{1}{3}$ of an inch broad, at length nearly plane, umbilicate, impresso-striate, dry, submembranaceous, whitish brown. Stem $\frac{1}{2}$ an inch high, scarcely half a line thick, firm, solid, nearly equal, pale or brownish pulverulent, clothed towards the base with minute furfuraceous scales. Gills brownish-carneous, unequal, forked, subdecurrent, undulated.

Agreeing in habit with *M. fœtens*, but the stem is more opake, and the gills are by no means annulato-adnexed. The stem of all the specimens of *M. fœtens* which have been inspected, including the original specimens of Sowerby, are nearly, if not quite, smooth.

208. *M. spongiosus*, Berk. and Curt.; pileo plano albido-fusco; stipite pulverulento basi incrassato spongioso fulvo-villoso; lamellis albidis subconfertis. Curt., No. 1257.

HAB. On decaying leaves in woods. South Carolina. June, 1847.

Pileus $\frac{1}{3}$–$\frac{1}{2}$ an inch broad, whitish brown, darker in the centre, plane, obtuse. Stem $1\frac{1}{2}$ inch high, brown, furfuraceo-pulverulent, much twisted, incrassated at the base, and clothed with tawny villous flocci. Gills broad, dull white, rather crowded, slightly adnate.

Allied to the two foregoing species, but differing very much in the nature of the stem, which is by no means inserted into the matrix.

209. *M. similis*, Berk. and Curt.; pileo membranaceo plicato opaco albido; stipite gracili elongato nitido fusco; lamellis paucis latis adnexis venoso-connexis albidis. Curt., No. 1319.

HAB. On twigs. South Carolina.

Gregarious. Pileus 2–3 lines broad, dull white, smooth, plicate, covered with minute wrinkles when dry. Stem 2 inches high, very slender, brown, shining, scarcely if at all pulverulent. Gills broad, ventricose, adnexed, connected by a few veins.

Nearly allied to *M. hæmatocephalus*, from which it differs principally in colour.

210. *Lentinus Ravenelii*, Berk. and Curt.; pileo umbilicato submembranaceo striato squamuloso maculato; stipite curto tenui furfuraceo-squamoso; lamellis tenuibus subdistantibus dente-decurrentibus venoso-connexis. Curt., No. 1706.

HAB. On decaying wood in wet places. Santee River, South Carolina. April. Mr. H. W. Ravenel.

Scattered. Pileus 1–1½ inch broad, plano-convex, umbilicate, submembranaceous, white, clothed with minute rufous velvety scales, which are crowded and confluent in the centre. Stem 1 inch high, 1 line thick, solid, white with rufous scales. Gills rather distant, thin, slightly decurrent, white, connected by veins, slightly jagged.

A very pretty species allied to *L. tigrinus*, but far more delicate. The pileus is very thin, and in consequence, when dry, it has an hygrophanous aspect.

211. *Lenzites ungulæformis*, Berk. and Curt.; albida lignea subtriquetra inæquabilis glabrata nitida: lamellis ligneis latis poroso-ramosis. Curt., No. 24.

Hab. On decayed wood. North Carolina.

Hard; woody, dirty white. Pileus subtriquetrous, rather elongated, 2 inches broad, 1¼ long, ¾ thick, villous when young, but soon smooth and shining; surface unequal, once or twice sulcate, with some trace of the almost obliterated villosity towards the margin. Gills broad, thin but woody, branched, and here and there forming sinuous pores.

Allied to *Lenzites betulina*, but a more rigid species. It resembles also *Lenzites aspera*, but has not the scabrous surface of that species, nor has it the same habit.

212. *Boletus Ananas*, Curt. MSS.; pileo floccoso-verrucoso; floccis supra candidis, subtus carneis; margine lacerato membranaceo; stipite candido; poris planis luteis. Curt., No. 1649.

Hab. Near old pine logs. June–Oct. South Carolina.

Pileus 2 inches or more broad, convex, thick, floccoso-verrucose; flocci whitish above, pink below; margin membranaceous, torn. Stem 4 inches high, solid, white, nearly smooth. Porous, plane, rounded behind, yellow or greenish yellow. Spores oblong, ferruginous, or, when seen by transmitted light, yellow.

Resembling in general appearance *Boletus floccosus*, but distinguished by its nearly smooth stem and ferruginous, not brown, spores. It has lately been published with some others in a number of Silliman's Journal, which has not yet reached this country.

213. *Polyporus Curtisii*, Berk. MSS.; pileo excentrico molli-suberoso sulcato zonato ochroleuco hic illic sanguineo-laccato. Stipite elongato, rugoso, sanguineo-laccato. Hymenio ex albo ochraceo; poris punctiformibus. Curt., No. 549, 577, 908, 979, 1131, 1525.

Pileus 3–6 inches across, excentric, convex, more or less grooved and zoned, of a rather soft corky texture, covered with an ochraceous, often opake, laccate crust, which is in parts sanguineous. Substance towards the tubes cinnamon, above ochraceous, not zoned, traversed with laccate lines parallel to the surface. Margin obtuse. Stem 2–5 inches high, ½–1 inch thick, rough, sanguineo-laccate. Hymenium white, here and there ochraceous, often partially laccate. Pores punctiform, not angular, cinnamon coloured, within stratose.

This splendid species is closely allied to *P. lucidus*, but differs in its beautiful pale ochre-yellow tint, its punctiform pores, and in its substance not being zoned. The true *P. lucidus* occurs in the same district, retaining exactly the character of European specimens. There is also some resemblance, especially in the punctiform pores, to *P. ochreolaccatus*, Mont., but the habit and whole appearance of the two species is very different.

214. *P.* (Anodermei) *Caroliniensis*, Berk. and Curt.; pileo mollisuberoso reflexo postice effuso inæquabili ochraceo-albido subsericeo strigis innatis asperulo, subzonato; poris mediis dentatis acie plus minus lacerata. Curt., No. 948, 998, 1390, 1495.

HAB. On oak and Liquidambar. South Carolina.

Pileus 1½–5 inches broad, ½–2 inches long, much effused behind, sometimes nearly resupinate, of a soft corky texture, unequal, rugose, slightly silky with innate or raised strigæ which sometimes project from the surface, sometimes nearly smooth with innate fibrillæ; margin acute. Pores of the same colour as the pileus, middle-sized, $\frac{1}{36}$ of an inch broad, more or less toothed and lacerated; dissepiments thin, often broken up; in some specimens, however, the edge of the pores is obtuse.

Resembling *P. borealis*, Fries, and *P. symphyton*, Schwein, but of a softer looser texture than either, and having larger pores than the former. Specimens vary much, but there appears in none any tendency to become spathulate.

215. *P.* (Placodermei) *palustris*, Berk. and Curt.; pileo carnoso-suberoso dimidiato obtusissimo cute tenui rivulosa nitidiuscula vestito; poris niveis non stratosis minutis angulatis. No. 1566.

HAB. On *Pinus palustris*. Santee River, South Carolina. Mr. Ravenel.

Pileus 2 inches broad, 1 inch long, ½ an inch thick, dimidiate, subungulate, extremely obtuse, clothed with a rather shining, thin, cracked,

ochraceous cuticle. Substance white, uniform. Pores about two lines long, minute, white within and without, not at all stratose, slightly angular, with thin dissepiments and a rather irregular edge.

Nearly allied to *P. officinalis*, but the pores are smaller, pure white, and not at all stratose, nor is the flesh bitter when dry, or easily reduced to powder. With *P. betulinus* also it has a very close affinity, but differs in habit, having no tendency to become spuriously stipitate, nor has the cuticle the brown tinge or minutely scabrous appearance of that species.

216. *P.* (Placodermei) *cupulæformis*, Berk. and Curt.; pileo pezizæformi e vertice elongato stipitato albido cinnamomeo puberulo; hymenio plano-excavato cinnamomeo; poris minimis. Curt., No. 1209.

HAB. On dead bark of *Rhus copallina*. South Carolina.

Gregarious. Pileus 1–1½ line broad, pezizæform, attached by the vertex which is elongated into a short stem, cinnamon clouded with white, slightly downy. Hymenium plane, but sunk beneath the swollen margin, cinnamon; pores very minute.

This has precisely the habit of *Sphæria cupulæformis*, Schwein. It is allied to *P. pullus*, Mont. and Berk. It is probably not uncommon. Dr. Léveillé has received it from a higher part of America.

217. *P.* (Inodermei) *Xalapensis*, Berk. MSS.; pileo flabelliformi membranaceo zonato sericeo glabrescente; poris parvis dissepimentis tenuibus membranaceis hydnoideo-laceratis. Curt., No. 1452.

HAB. On dead branches. Xalapa; Mr. Harris. South Carolina; Mr. Curtis.

Thin, membranaceous; pileus flabelliform, variously lobed, 2–4 inches long, pale, silky, at length nearly smooth, and shining, repeatedly but delicately zoned. Hymenium white; pores small, dissepiments very thin and delicate, soon torn, and toothed so as to give the plant the appearance of a *Hydnum*.

Closely allied to *P. elongatus*, Beck., but more delicate and shining and differing essentially in the long membranaceous hydnoid teeth into which the dissepiments are broken up at an early stage of growth. In the South Carolina plant this character is even stronger than in that from Xalapa.

218. *P.* (Inodermei) *chartaceus*, Berk. and Curt.; rigido-membranaceus ambiens e resupinato utrinque reflexus; pileo leviter zonato albido sericeo; poris sistotrematoideis pallidis. Curt., No. 756.

Hab. On the under-side of fallen trunks and limbs of the Tulip Tree. North Carolina.

Effused for many inches and completely surrounding the smaller branches, broadly reflexed; margin membranaceous, but rigid, obscurely zoned, dirty white, slightly silky, but by no means hairy or bristly. Pores middle-sized, about $\frac{1}{50}$ of inch broad, soon broken down into obtuse lamellar processes, extending to the margin where they are shallow and more distant.

Allied to *P. pinsitus*, of which at first we were inclined to think it a variety, but differing in its nearly smooth pileus and the singularly decomposed pores.

219. *P. salmonicolor*, Berk. and Curt.; resupinatus crassus mycelio mucedineo albo, poris rotundis rubellis demum elongatis purpureo-fuscis. Curt., 1527.

Hab. On burnt pine logs. Santee River, South Carolina. Mr. Ravenel.

Effused, resupinate, several inches broad, thin near the margin, thick in the centre, of a rich salmon-colour, at length brown. Mycelium white, mucedinous. Pores rounded, small, at length torn and angular. When fresh this appears to be very tender and easily injured, in which state it becomes dark purple brown, with a resinous aspect.

Apparently the same species occurs in Sir W. J. Hooker's Herbarium under the name of *P. spissus*, so marked by Schweinitz, but he sent a very different thing under that name to Fries. It does not appear to be closely allied to any described species. Its nearest affinities are with *P. purpureus*, Fr., and *P. rhodellus*, Fr., or better with *P. carneo-fuscus*. P.

220. *P. cremor*, Berk. and Curt.; resupinatus, albus; margine obsoleto poris parvis subrotundis, dissepimentis crassis, acie obtusissima.

Hab. On decayed oak branches and frequently on the discs from whence twigs have been broken off. South Carolina.

Resupinate, white, about an inch broad, consisting almost entirely of tubes. Margin obsolete. Pores small, round or slightly sinuated, their edge very obtuse.

A distinct but not very remarkable species, allied most to *P. vulgaris*, but differing in its thick dissepiments and the obtuse edge of the pores.

Notes and Observations on the Botany, Weather, &c., of the United States, made during a tour in that country in 1846 *and* 1847. *By* WM. ARNOLD BROMFIELD, M.D., F.L.S., &c.

(*Continued from page* 20.)

In proceeding up the river, to the scenery on which no words can do justice, the chief difference in the nature and aspect of vegetation was the gradual and increasing frequency of Pines and other Coniferæ amongst the hardwood trees, as we advanced northwards. The species was chiefly the Hemlock Spruce (*Pinus Canadensis*), and its prevalence might be as much owing to the increasing rocky nature of the soil as to the higher latitude attained. I did not then land at Albany, the capital of the State of New York, deferring my visit to that city till my return southwards from Canada. The town has an imposing aspect from the Hudson, but disappoints expectation on a nearer acquaintance. I found, on landing at Troy, five miles above Albany, an extraordinary decrease in the temperature from what it had been the day before; it now felt quite cool and autumnal, and the next morning absolutely chilly. Here the Catalpa, Ailanthus, and Broussonetia give place to trees of a hardier kind along the "side-walks" in the streets; the Horse-chestnut, Elm (*Ulmus Americana*), and Maple (*Acer saccharinum* and *A. dasycarpum*), being the usual substitutes. The only Weeping Willow I remarked, would have been thought but an indifferent specimen of its kind at New York; the soil around Troy seems, however, so poor as, independently of climate, to account for the diminished stature of the trees, and whilst vegetation was fresh and vigorous along the lower course of the Hudson, here it was quite burnt up for want of moisture. Troy is a large, handsome, and thriving place, and on the manufacture of "Trojan Stoves," and the productions of its numerous founderies, rest the chief claims to celebrity of this modern Ilium.

Sept. 10th.—Left Troy, for the west, by an excellent railroad to Buffalo, through Utica, Syracuse, Auburn, Geneva, Rochester, and Attica, with a thousand other places known and unknown to fame, formerly supposed to be separated by wide intervals of land and sea, and speaking divers tongues, but now ascertained by the light of republican geography, to be all within an easy day's journey of one another, and English the only language, at present, spoken in any of the most renowned cities of classical antiquity, which this happy discovery has resuscitated and made quite accessible to modern travellers. This long line of railway (325 miles) is in the hands of different companies,

but the gauge being, I believe, the same throughout, the amalgamation of the various portions is complete, and, apparently, under excellent management. Auburn, where I stopped for the night, is 173 miles from Albany, and is not exactly what Goldsmith has depicted it, lovely and deserted, a most unromantic smartness, and a thriving population being its present characteristics. The state prison here is an immense structure, and much celebrated for the system of discipline pursued towards its unfortunate inmates, which, had time allowed, I should have liked much to have visited. The town, from what little I saw of it, has that air of extreme cheerfulness, so characteristic of American cities of recent formation, and which the glorious brightness of a transatlantic autumn day, contributed greatly to enhance. The morning was very cool and fresh when the railway cars started for the west, but became quite warm as the day advanced, though not oppressively so during any part of it. The soil in that portion of the State of New York passed over yesterday, seemed generally poor and rocky, the country undulating, and in some places hilly, and almost everywhere well timbered, the trees small, or at most of medium size. At Schenectady, a very pretty and thriving-looking town, I remarked many trees of the Honey Locust (*Gleditschia triacanthus*), small but healthy, with pods on them. Beyond Chittenango observed the White or Soft Maple (*Acer dasycarpum*), very abundant in the woods. Some Tulip trees were also seen here and there of very diminutive size, scarcely more than bushes. *Compositæ* were now abundant, and the fields and moist woods were richly ornamented with a Solidago, having recurved branches to the panicle (*S. Canadensis*?), similar to, if not the same with, one extremely common in our cottage gardens. A small pale yellow butterfly (*Colias Philodice*), plentiful from Canada to Carolina, was abundant along the line from Troy to Utica, though not swarming in such infinite numbers as I have seen it do about West Chester. In England the speceis of *Colias* are seldom visible till towards the end of summer or in the autumn; in America, on the contrary, this and other kinds of the genus appear in spring, and *C. Philodice*, in particular, flutters over the fields in infinite myriads the whole summer through. The country gone over on this day's route, from Auburn to Buffalo, was beautiful all the way, and for the most part undulating or hilly; a great deal of forest ground in process of being cleared, as I remarked the blackened stumps of those lately felled in the corn (Maize) fields, whilst in many places they were still burning.

The trees were mostly tall, straight, and devoid of branches till towards their summits, the boles very clean, but of no great diameter. Apple orchards were common along the whole line of road, the trees healthy and well laden with fruit. Boys brought apples, pears, plums and peaches to the railway cars for sale; the first pretty good, the pears generally hard and indifferent, (the American climate does not seem favourable to this fruit, still less so to the apricot, which is rarely seen anywhere,) the plums (of a yellow kind) tolerable, the peaches of medium quality or variable, as I found them farther south, sometimes pretty soft and juicy, but often hard and juiceless. The apple and the peach may be considered as the two most valuable of Pomona's gifts in America, which, from some defect of climate, or from the number of insects injurious to the trees, is inferior to Europe in the variety and excellence of its fruits. The apple thrives admirably in the central and northern states, and as far as Montreal, in Canada, splendid orchards of this fruit are to be seen. The peach is abundantly grown throughout the Union, but being mostly, if not always, raised from the stone, many worthless varieties are produced, and the better kinds are transient, or no trouble is taken to perpetuate good sorts by grafting, which indeed would not repay the labour of doing from the short-lived nature of the tree in this climate, which comes into bearing in three or four years from the kernel, and does not last above eight or ten before requiring to be renewed. The peaches of New Jersey are esteemed for their excellence, but to the northward of that state the summers are too short and cool for the perfect maturing of the fruit, and the trees themselves are apt to be injured by the rigour of winter. The most northern station at which I remarked the peach as a standard, small, indeed, but apparently healthy, was at Burlington in Vermont (lat. 44° 27′), but the vicinity of Lake Champlain, on whose shores the town is situated, has a mitigating effect on the otherwise severe climate of that part of the Union, for at Montreal, just one degree due north of Burlington, the peach has disappeared from the orchards and sought the shelter of the garden wall, being unable to resist the winter any longer as a standard fruit-tree.

I shall have occasion to speak of the other fruits cultivated in America in a subsequent part of this journal. *Datura stramonium* and its variety *D. tatula* seemed to have wholly disappeared, or to have become extremely scarce, since leaving New York, as I hardly remarked it on any part of the line of road betwixt Troy and Buffalo, or on the waste

lots of such towns as I stopped at on the way. At Niagara it appeared to be equally rare or wanting. Arrived late this evening at Buffalo, whose spacious streets, with their lofty houses and handsome stores, inferior to few in our own metropolis, and scarcely less bustling, are planted with the Locust tree (*Robinia pseudo-acacia*), which thrives remarkably well and attains a large size, as do the Lombardy and other Poplars and the Sugar Maple, trees which here supplant the less hardy denizens of the Atlantic cities to the southward.

Sept. 12th.—From Buffalo to Niagara Falls there is a railway, which brought me to the latter in an hour and a half, across a country more picturesque than any I had seen since leaving the Hudson. As every traveller is supposed to be in ecstacies at the first sight of the Falls, the reader is or ought to be spared the superfluous annoyance of a recital of his or her feelings on the interesting occasion; for which cause I shall be content to observe that, without betraying any symptoms of temporary derangement by the perpetration of ode, sonnet, soliloquy, or other extravagance, I may take credit for as much emotion as could well be felt within the verge of sober-mindedness. For the two days I remained at the Falls, I could rarely withdraw myself from the sublime spectacle; to return to it seemed an impulse rather than an act of volition, which to have resisted would have been vain. I saw the cataract under every variety of atmospheric vicissitude of cloud and sunshine, at morn, noon, and even, and under all alike ineffably glorious. I know not if others have been struck as well as myself with the peculiar appearance of the water, from the moment of commencing its descent till lost to the eye in the snowy vapour which fills the abyss beneath. It no longer looks like water, fluid and yielding, but hard, heavy, and palpable as adamant. I could fancy I saw millions of tons of the purest white marble and rock crystal, mixed with pulverized diamond and emerald (the half of the great Horse-shoe Fall shows a resplendent green), pouring over the precipice and disappearing in a cloud of glittering atoms raised by their mutual attrition. If the eye be fixed on any point of the falling mass of waters, and follow it in its downward course till lost in the spray, no alteration of form or colour is perceived through the whole of its apparently slow and perpendicular descent; the face of the mighty cataract seems rough with angular sparkling points and projections, like as of solid bodies forced over and grinding against each other, here splitting into fragments, there preserving their integrity.

Though the weather here was fine, the number of visitors at the village (called Manchester) appeared to me small, and the place in consequence very quiet. As may be supposed it abounds with large and very good hotels, but I suspect that the Spas of Saratoga and Ballston have greater attractions for the American public than the wonders of Niagara; the advanced season made it expedient not to lose time in visiting Canada, as otherwise I should certainly have taken a peep at those celebrated watering-places. About 2 P.M., a heavy shower came on with much wind and a good deal of thunder, but distant, and I was again disappointed in not witnessing an American thunderstorm in all its alleged terrors and sublimity.

The vegetation around the Falls consists principally of deciduous trees, the only evergreens being the Arbor Vitæ (*Thuja occidentalis*) and Red Cedar (*Juniperus virginianus*). The largest trees were on Goat Island, where in addition to the above grew the Sugar Maple (*Acer saccharinum*), very fine:* Basswood (*Tilia glabra*), a very prevailing species in Upper Canada; Beech (*Fagus ferruginea*); Hornbeam (*Carpinus Americana*); Iron-wood (*Ostrya Virginica*), common and great American Aspen (*Populus trepida* and *grandidentata*); Black Cherry, or Sweet Birch (*Betula lenta*), a beautiful and valuable species; one or two Oaks (*Quercus coccinea* and *rubra*); and a single small specimen of the Yellow or Tulip Poplar (*Liriodendron tulipifera*), which, I presume, must be a very rare production about the Falls, since the only example I found on Goat Island had been carefully protected by a wooden fencing, and an inscription deprecatory of commemorative penknives:—"This tree not to be carved on!" The undergrowth consisted of the White-berried Dogwood (*Cornus stolonifera*, Mx., *C. alba* of authors, not of Linn.), a northern species universally propagated in English shrubberies, and abundantly wild in Canada; its fine fruit, of an ivory white when in maturity, at length becoming lead blue, as I have also remarked it in England, probably from over-ripeness. *Cornus circinnata*, likewise common, a species which some years since was brought into transient notice for its medicinal virtues, now made a handsome appearance with its large round leaves and broad clusters of pale light blue berries, as did the grey-green foliage of *Shepherdia Canadensis* and that of the graceful Stag's horn Sumach (*Rhus typhina*), now glowing in its rich autumnal

* One very old Sugar Maple on Goat Island must have been nearly four feet in diameter, and though much decayed at top, seventy feet or perhaps more in height.

colouring. A very spiny Gooseberry, probably *Ribes Cynosbati*, but neither in flower nor fruit, grew under the shade of the trees, as did the Flowering Raspberry (*Rubus odoratus*), whilst the Poison Ivy or Oak (*Rhus Toxicodendron*), the Virginian Creeper (*Ampelopsis quinquefolia*), and Waxwork (*Celastrus scandens*), climbed up the trees; this last now displaying its beautiful fruit, the valves of which spread widely open and disclose the seeds in their pretty scarlet or orange arils, that have the appearance of large berries from their coherence in a globose form, which is that of the capsules. I did not notice the American Yew or Ground Hemlock (*Taxus Canadensis*), said to be common at or near the Falls.

On the 14th of Sept. I left the Falls (Manchester) for Lewiston on the Niagara River, from whence there is a steamer to Hamilton, C.W., at the bottom of Burlington Bay, at the south-western extremity of Lake Ontario. The scenery on both sides of the river is charming, and the snail's pace at which we were drawn along on a tram-road to Lewiston, afforded full opportunity for enjoying the scenery. The country was well cultivated, but the crops were now off the ground. Indian corn seemed to prevail over other grain here. The land was much infested with *Verbascum Thapsus*, a common and troublesome agricultural weed in the northern parts of America, though supposed to have been introduced from Europe. Amongst the commoner trees of the country I noticed *Quercus montana* and what appeared to be *Q. discolor* in considerable abundance. The weather in the morning was warm and beautiful, but later in the day became much overcast, with incessant lightning on Lake Ontario till we reached Hamilton late at night, where much rain seemed to have fallen.

Hamilton is a rising place, containing many good and some handsome houses, the streets, as in all modern American towns, extremely wide, but the lower part of the town along the lake is subject to ague at particular seasons. The country around is charming, especially the rich valley formed by two nearly parallel, thickly-wooded ridges, called the Flamborough and Dundas mountains. Having relations in this part of Canada, I remained in Hamilton and its neighbourhood till the 22nd, chiefly near Ancaster, a straggling village of truly Canadian aspect some miles to the southwest, but in a beautiful district. The season was too far advanced for the summer plants, and many even of the autumnal species were out of bloom. Amongst the few herbaceous species in flower or fruit were *Leersia oryzoides* (extremely common

here and in the States in low moist grounds), a *Bidens* (with radiant flowers), *Aquilegia Canadensis*, *Leptanthus nepetoides* (Ancaster), *Polygala verticillata* (common in pastures), *Lobelia inflata* and *syphilitica* (the latter frequent in wet meadows, the former in dry fields), *Asclepias Syriaca* (along fences), &c. A little way out of Hamilton I picked *Chenopodium hybridum* and *C. botrys*, and *Abutilon Avicennæ* occurred sparingly on the road to Ancaster. At the very pretty and thriving village of Dundas, situated in a lovely valley under thickly-wooded rocky hills, *Leonurus cardiaca* and *Cynoglossum officinale* grew in plenty, both supposed to have been introduced from Europe, but now frequent in many parts of the continent about houses. In woods at Oakwood Farm grew *Arum triphyllum*, *Monotropa uniflora* (abundant under the Weymouth pines), *Gentiana crinita*, and in the same neighbourhood *Inula Helenium* was perfectly naturalized in rough pasture ground but near a farm house, about which I noticed *Œnothera biennis*, *Epiphegus Americanus*, and *Smilax herbacea*; the last now in ripe fruit, forming globose bunches of bluish black berries, is distinguished by the disgusting carrion-like smell of the flowers. The arborescent vegetation around Hamilton does not materially differ from that of Niagara and the intervening country, which are all on the same parallel, and consists chiefly of hard-wood or deciduous trees, of which the following are the principal:—Red and White Oak (*Quercus coccinea* and *Q. alba*); Sugar Maple (*Acer saccharinum*), abundant; Red or Scarlet Maple (*A. rubrum*), less frequent; Butter-nut (*Juglans cinerea*) common; Hickory (*Carya alba*), and probably other species; Beech (*Fagus ferruginea*), plentiful in woods; Chestnut (*Castanea vesca*), common; Basswood (*Tilia glabra*); Hornbeam (*Carpinus Americana*), called here Blue Beech; Hop Hornbeam or Ironwood (*Ostrya Virginica*), both these last frequent; and Elm (*Ulmus Americana*). The Buttonwood (*Platanus occidentalis*), called also Sycamore and Water Beech in America, appeared to be rare in this part of Canada, as I observed but few specimens and those not remarkable for size. The White Oak is common, and yields its valuable timber of good scantling; here it has the same straight trunk, fastigiate growth, and regularly pinnatifid leaves which invariably distinguish it from our British Oak wherever I have seen it, whether in the north or south. The Sugar Maple is in this latitude one of the prevailing trees. The Basswood (*Tilia glabra*) abounds around Ancaster, often reaching a vast size and height, and is one of the most stately forest-trees of the

north, though of little value for its wood. The Beech (*Fagus ferruginea*) abounds, and though long held a variety of the European *F. sylvatica*, is, I think, unquestionably distinct. It is a handsomer tree than ours,* with much larger, longer, more pointed or even acuminate leaves, nearly as strongly serrated as those of the Chestnut, of the aspect of which the tree so strongly partakes, that I have repeatedly been deceived by the young Beeches in the woods into the belief that they must be Chestnuts, and that in parts of the country where the latter are not found wild, as about Quebec. The American woodmen profess to distinguish two kinds of Beech, the red and the white, guided chiefly by the colour of the wood in both; hence arose a second species, the *F. ferruginea* of Aiton, now applied by my friend Dr. Torrey to the only known species inhabiting America, where it has a very extensive range from north to south. Michaux (N. American Sylva) figures two species, one which he calls *F. sylvestris*, meaning probably *F. sylvatica* of Linn., having fruit small like the European Beech, with erect prickles, and nuts somewhat obtuse and mucronate at the apex, which, he says, is the common Beech of the middle and western States; the other, which he styles (after Muhlenberg) *F. ferruginea*, the fruit of which is much larger, and, as drawn by him, scaly, with the prickles pointing forwards, and the nuts acute or pointed. This kind he states to be abundant in the north and north-western section of the Union, and, as represented in his fine work on the forest trees of North America, has leaves still more serrated or chestnut-like than the first.† The degree of serrature assuredly varies in different leaves, but they are always larger, less elliptical, and more pointed than in the European tree, however they may occasionally approach those of *F. sylvatica* in form. I cannot find any material difference in the fruit or its envelopes, except that the nuts are a little shorter and broader in the American than in the European Beech; the involucres in both are clothed with ferrugineous down, as are likewise the strongly curved prickles.

* The superiority in point of beauty between nearly allied American and European species is not always on the side of the former. The common Holly of America (*Ilex opaca*) is greatly inferior in this respect to *I. Aquifolium*, as are *Cercius Canadensis* and *Diospyros Virginiana* to their Old World congeners, *C. Siliquastrum* and *D. Lotus*, betwixt all which there is the greatest possible affinity in botanical character.

† It is remarkable that Michaux asserts his *F. ferruginea*, or Red Beech, to be that one most allied to the European species, whilst the reverse is shown by the plate and description of the same author's *F. sylvestris*, or White Beech; there is some confusion in his account of these trees.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

Continued from p. 89.

Calcutta to Darjeeling in Sikkim-Himalaya.

Here, at the foot of the cliffs, which towered imposingly above our heads, and were seen through the tree-tops, are several small seams of coaly matter in the sandstone, with abundance of Pyrites, sulphur, and nauseous efflorescences of salts of iron, but no real coal. Some springs from the cliffs above are charged with lime, of which enormous tuff-beds are deposited on the sandstone, full of impressions of the leaves and stems of the surrounding vegetation. In some parts of their course, the streams take up quantities of inflorescences which are spattered over the sandstones in a singular manner.

At Akbarpore I had sunk two thermometers, one to the depth of 4 feet 6 inches, the other 5 feet 6 inches, which both indicated 76° during the whole time of my stay, the air varying at the surface from 56° to 79° 5′. Dew has been formed every night, on the plains, since leaving the hills at Dunwah, the grass being here cooled 12° below the temperature of the air.

Feb. 19th.—We marched up the Soane to Tura, passing some low hills of limestone, between the cliffs of the Kymaor and the river. I collected *Ulmus integrifolia*, a small *Clerodendron*, and a pretty bell-flowered *Asclepias* crawling over the hedges, and botanized by the banks of the river, which is lined with small trees of *Ficus*, *Terminalia*, *Phyllanthus*, *Trophis*, and various shrubs, one a very sweet-scented *Vitex*, with clusters of white flowers, also *V. Agnus-castus* (?) or *Negundo*. On the shaded banks grew abundance of a *Myosotis* like *Cynoglossum*, *Veronica*, *Potentilla*, *Ranunculus sceleratus*, *Rumex*, several herbaceous *Compositæ* and *Labiatæ*: *Tamarix* was plentiful on rocky hillocks in the bed of the river, and in pools grew several aquatic plants, *Zannichelliæ*, *Naias*, *Chara*, a pretty little *Vallisneria*, and a *Potamogeton* with filiform leaves: *Riccia* was very abundant in damp places. The Brahminee goose was common here, and we occasionally saw immense flocks of wild geese over-head, flying north.

Here I tried again the effects of solar and terrestrial radiation, on the sand at different depths, not being able to do so on the alluvium :

Temperature of air, 87°

Noon.			Daylight of following morning.	
Surface	110°*		57°	
1 inch.	102		52 5′	
2 „	93 5′		58	
4 „	84		67	
8 „	77	Sand wet.	73	Wet.
16 „	76	do. do.	74	

Feb. 20th.—From Tura we have again to cross our little army over the Soane, the Kymaor scarp approaching too near the river on this west side to allow our passing along its base. The bed is very unequal, and about one mile and a half across (apparently). I found the male *Vallisneria* flowers, after a great deal of hunting: it is impossible to distinguish them from the gnats' eggs with which the pools swarm. The elephants were employed again, as at Barroon, to push the carts across: one of them had a bump, in consequence, as large as a child's head, just above the trunk, and bleeding much; but the brave beast disregarded this, when the word of command was given by his driver. The stream was very narrow, but deep and rapid, obstructed with beds of agate, jasper, and chalcedony. A clumsy boat took us over to the village of Dumersolah or Soane-pore, a wretched collection of hovels. The crops were thin and poor, and I saw no Palms or good trees. Squirrels, however, abounded, and were busy laying up their stores: descending from the trees, these little animals scoured across the road to a field of tares, mounted the hedge, took an observation, foraged, and returned up the tree with their booty. Quickly they descended and repeated the operation of reconnoitering and plundering.

The bed of the river here is considerably above that at Dearee, where the mean of the observations with those of Barroon, made it about 530 feet—the mean of those here and on the opposite side at Tura gives about 640 feet, a fall of 110 feet in only forty miles.

The sandy banks of the Soane are full of martens' nests, each now containing a pair of eggs. The deserted ones are literally crammed with long-legged spiders, which may be raked out with a stick, and come pouring down the cliffs like corn from a sack, in quantities quite inconceivable. I did not observe the marten to feed on them.

The Entomology here resembled that of Europe more than I expected in a tropical country, where *Carnivoræ*, at least *Carabideæ* and

* Thermometer not registered above this temperature.

Staphylinideæ, are generally considered uncommon. The latter tribes here swarmed under the clods, of many species too, but all small, and so singularly active, that I could not give up time enough to collect well. In the soil again, the round, egg-like, earthy chrysalis of the *Sphinx Atropos* (?), and the many-celled one of the leaf-cutter bee, were most frequent.

A large *Euphorbia* (*E. ligulata* ?) is common all along the Soane, and, indeed, used everywhere, since leaving Dunwah, for fencing. I have not seen the *E. Indica* and the *E. tereticaulis*, or very rarely, since quitting Calcutta, nor yet the *Opuntia*.

From this place onwards, up the Soane, we have no road of any kind, and are compelled to be our own road-engineers. The sameness of the vegetation and lateness of the season for botanizing made me the less regret this, having expected both luxuriance and novelty in these seldom-visited and never botanized wilds. Before us the valley narrowed considerably: the woods became denser, the country on the south side was broken with rounded hills, and on the north the noble cliffs of the Kymaor almost dip down to the river. The villages, too, are smaller, more scattered and poverty-stricken, with the Mahoua and Mango alone of the usual trees, the Banyan, Peepul, and Tamarind being rare. The natives look more of a jungle race: they are tall, athletic, erect in gait, less indolent, and more spirited than the flat and insipid natives of the comparatively civilized countries.

Feb. 21st.—Started at daylight; but so slow and difficult was our progress, through fields and woods, and across deep gorges from the hills, that we only got five miles in the day. The elephant's head too ached too severely to let him push; and the cattle will not advance when the draft is not easy; nay, what is worse, it is impossible to get them to pull together up the inclined planes we cut, except by placing one man at the head of each of the six, eight, or ten in a team, and playing at screw-tail, when the obstinacy of one capsizes the vehicle. The small garrys and hackeries (native carts) got on better; though it was most nervous work to see them, rushing down the steeps, especially those which are loaded with our fragile articles and the awkward palkees, which we had no other means of transporting, but upon wheels.

Kosderah, where we halted, is a pretty place, with a broad stream from the hills running past it. These hills are of limestone, and

rounded, resting upon others of hornstone and jasper. The camp was pitched by three small trees of Paper Mulberry (I take them to be,—a tree which I had not seen before, and which is unfrequent here). Following up the little stream, I gathered two species of *Potamogeton* and *Vallisneria*, the latter forming an elegant green carpet in very rapid water, its corkscrew stems always on the stretch. Two *Æschynomenes* abounded, with a *Jussieua* and *Cyperus*, and several Grasses, and *Sphenoclea* (?).

At the rapids, the stream is crossed by large beds of hornstone and porphyry rocks, excessively hard, and pitched up at right angles, or with a bold dip to the north. The number of strata was very great, and only a few inches or even lines thick: they presented all varieties of jasper, flint-rock, hornstone, and quartz of numerous colours, with occasional seams of porphyry or breccia. Hills composed of these rocks, similarly *heaved*, attest the granite range of Paras-Nath, from the Ganges to as far up the Soane as we went; and perfectly similar rocks occurred again on the Ganges, at the north-east of the same range, in the celebrated rocks of Monghyr, Colgong, and Sultanpore. They appear to form a deep bed, overlying the gneiss and granites above-mentioned, and thrown up by the great range.

The numerous little islets in the rapids were elegantly fringed with beds of a Fern I had not hitherto seen (*Polypodium*), and, indeed, the only species which the Soane valley presents at this season.

Returning over the hills, I found the *Boswellia*, *Gmelina parviflora*, with the common trees of the heights, also *Hardwickia binata*, a most elegant Leguminose tree, tall, erect, with an elongated coma and the ultimate ramuli pendulous, covered with bipartite leaves. All the hills were coated with a shallow bed of alluvium, containing abundance of agate pebbles and kunker, the former evidently derived from the quartz strata above-mentioned.

At night the fires on the Kymaor hills afforded a splendid spectacle, the flames in some places leaping zig-zag from hill to hill in front of us, and looking as if a gigantic letter W were written in fire.

Feb. 23rd.—Start at daylight, moving the camp up the river with great difficulty to Panchadurmah. High north-west (the prevailing) winds generally commence at, or before, sun-rise, and become moderate at sun-down: in the narrow valley they blow with concentrated force, and are so loaded with dust that the hills close by are often obscured; and on their subsiding, the atmosphere clears remarkably suddenly.

Feb. 24th.—Following up the Soane to Pepurah, the country becomes densely wooded, very wild and romantic. The Mahoua tree and *Nauclea*, *Hardwickia*, *Terminalias*, *Pongamia*, and *Strychnos* are very abundant; the *Ehretia lævis*, a small tree, was covered with white blossoms, and the new foliage of a dark green, shining and viscid. A fine *Strychnos* forms a densely foliaged tree, thirty to sixty feet high, some individuals pale yellow, as if dying, and others deep green, but both equally in apparent health. *Feronia Elephantum* and *Aegle Marmelos* are very abundant, with various Leguminous and Rubiaceous trees, *Sterculia* and the dwarf *Phœnix*, which I have never found in fruit, nor, indeed, in flower, except at Dunwah. Peacocks abound in the woods, and monkeys.

One of my garrys is broken down hopelessly, and advances on the spokes instead of the tire of the wheels.

By the banks of a deep gulley here the rocks are well exposed: they consist of soft shales, resting on the limestone which is nearly horizontal, and this again, unconformably, on the quartz and hornstone rocks, which are confused and tilted up at all angles. In one place I observed the strata of the latter, horizontal for a few feet, and suddenly turned up at right angles, with an arc less than a foot in span.

A noble spur of the Kymaor, like that of Rotas, here projects to the bed of the river, blazing at night with the beacon-like fires of the natives, lighted to scare the tigers and bears from the spots where wood and bamboo are cut. The night was calm and clear, with much lightning: the latter seemed attracted to the spur, and darted down, as it were, to mingle its flame with those of the forest. So many flashes appeared to strike the flames, that it is probably the rarefied air in their neighbourhood which attracts it.

Feb. 25th.—Awoke between 3 and 4 o'clock by a violent duststorm, which threatened to carry away the tents. Our position, at the mouth of the gully formed by the spur and opposite hills, no doubt accounts for it. The gusts were so furious, that it was impossible to observe the barometer, which I returned to its case on ascertaining that any indications of a rise or fall in the column must have been quite insignificant. The night had been oppressively hot, with many insects flying about, amongst which I noticed a *Forficula*, a genus very seldom known to take the wing in Britain.

At 8½ A.M. it suddenly fell calm, and we proceeded to Chakuchee, the native carts breaking down in their passage over the projecting beds of flinty rocks, or as they hurried down the inclined planes which we cut through the precipitous banks of the streams. Near Chakuchee we passed an alligator, just killed by two men,—a foul beast, about nine feet long, and of the Mager kind. More interesting than its natural history was the painful circumstance of its having just swallowed a child, that was playing in the water, while its mother was washing her domestic utensils in the river. The brute was hardly dead, much distended by its prey, and the mother standing beside it. A very touching group was this! the parent, with her hands clasped in agony, unable to withdraw her eyes from the cursed reptile, which still clung to life with that tenacity for which its tribe are so noted, and beside her the two athletæ leaning on their bloody bamboo staffs, with which they had all but despatched the animal.

The *Butea frondosa* is in full flower here, and a gorgeous sight. In the mass its inflorescence resembles sheets of flame: individually the flowers are eminently beautiful, their bright orange-red petals contrasting brilliantly against the jet black velvety calyx.

By the river I found species of *Gnaphalium*, *Paronychia*, *Tamarix*, a dwarf Acacia-like *Phyllanthus*, *Wahlenbergia*, *Campanula*, *Sagittaria*(?), *Vallisneria*, and *Lepidium*, Docks (*Rumex Wallichii*) in abundance, *Carices*, and many other herbaceous plants. Tortoises abound on the rocks, but pop into the water when disturbed.

The nests of the *Megachile* (leaf-cutter bee) were in thousands on the cliffs, with *Ephemeras*, caddis-worms, spiders, and many predaceous beetles; Lamellicorns are very rare, even *Aphodius*, and of *Cetoniæ* I did not see one.

The poor woman who lost her child earns a scanty maintenance by making *Catechu*. She inhabits a little cottage, and has no property but two Bhiles (oxen) to bring wood from the hills, and a very few household chattels; and how few these are is known only to persons who have seen the meagre furniture of Dangha hovels. Her husband cuts the trees in the forest, and drags them to the hut; but he is now sick; and her only son, her future stay, was he whose end I have just related. Her daily food is rice, with beans from the beautiful blue-flowered *Dolichos*, trailing round the cottage; and she is in debt to the contractor, who has advanced her two rupees, to be worked off in

three months, by the preparation of 240lbs. of *Catechu*. The present was her second husband, an old man; by him she never had any children, and in this respect alone did the poor creature think herself very unfortunate, for her poverty she did not feel. Rent to the Rajah, tax to the police, and rates to the Brahminee priest, are all paid from an acre of land, yielding so wretched a crop of barley, that it more resembled a fallow-field than a harvest-field. All day long she is boiling down the catechu wood, cut into chips, and pouring the decoction into large wooden troughs, where it is inspissated.

This Zillah is famous for the quantity of Catechu its dry forests yield. The plant is a little thorny tree (a dire enemy of mine), erect, and spreading a rounded coma of well-remembered prickly branches. Its wood is yellow, with a dark brick-red heart: it is most productive in January and useless in June.

Feb. 27th.—Left for Hirrah, through a similar country to that passed yesterday. Rocks all highly inclined, often vertical, of ribbon-jasper, quartz, and hornstone. Monkeys, parrakeets, and hornbills, pigeons, owls, and flocks of peacocks were seen. Found a Leguminous tree, very like the *Butea* in every respect but its small white flowers (probably *B. parviflora*), looking as if snowed upon, a *Gardenia* (?) with large oval fruit, eaten by the natives, *Phyllanthus Emblica*, *Kydia calycina*, and the dwarf *Phœnix*.

Feb. 28th.—Marched to Kotah, the path leading first over hills with the bed of flinty rock projecting everywhere, to the utter ruin of our vehicles and the elephants' feet, and then over undulating hills of limestone. On the latter found a tree of *Cochlospermum*; its curious fleshy branches spread out somewhat awkwardly, and each is tipped with a cluster of glorious golden-yellow blossoms, as large as the palm of the hand and very beautiful. I think Lindley is certainly right in referring it to *Cisteæ*: it is a tropical Gum-Cistus in features, produce, colour and texture of petals and their caducous frail nature. The bark abounds in a transparent gum, which the white ants seem fond of, for they have killed many trees here. At Kotah, a small village at the junction of the Soane, beside a river of that name, we encamped, and experienced another furious dust-storm from the north-west.

Scorpions appear very common here, they are of a small kind, an inch and a half long. We caught several under stones: one stung Mr. Theobald on the finger, the smart was like burning for an hour or two, and then ceased to be felt.

Feb. 29th.—Being now nearly opposite the cliffs at Bidjegir, where coal is reported to exist, we again, and for the last time, crossed the Soane. The ford is some three miles up the river, to which we marched through deep sand. On the banks saw a species of *Celtis*, covered with lac. This tree is said to produce it here in great abundance, as the *Butea* does at Burdwan, and the *Peepul* in many parts of the country: I do not know which yields the best, or whether the insects are alike on each; and the merchants do not distinguish the kinds. Whether they be the same or different insects, the power they are endowed with of producing the same coloured substance from trees of such totally distinct habit and Natural Order, is highly remarkable.

Here the bed of the Soane is about three-quarters of a mile broad, and the rapid stream fifty or sixty yards, and breast deep. The sand is firm and siliceous, with no mica. Nodules of coal are said to be washed down here from the coal bed of Burdee, a good deal higher up; but we saw none. The cliffs come close to the river on the opposite side, their bases are well wooded, and teeming with birds. The soil is richer, and the individual trees, especially of *Bombax*, *Terminalia*, and Mahoua, very fine. One specimen of the *Hardwickia*, about 120 feet high, was as handsome a monarch of the forest as I ever beheld, and it is not often that one sees any tree in the tropics, which, for a combination of beauty in outline, harmony of colour, and arrangement of branches and foliage, would form so striking an addition to an English park.

There is a large break in the Kymaor hills here, through which our route lay to Bidjegir and the Ganges at Mirzapur. The cliffs leaving the river and trending to the north, form a continuous escarpment, flanked with low ranges of rounded hills, and terminating in an abrupt spur (in Saxon *Ness* or *Naze*), hoary with a ragged forest.

Four alligators lay asleep, looking like logs of wood in the river, all of the short-nosed or Mager kind, dreaded by man and beast. I saw none of the curious and sharp-snouted species, so common in the Ganges, whose long *bill* and prominent eyes, just visible above the water, conjure up visions of *Ichthyosauri* and geological lectures. The latter alligators are harmless and fish-eaters only.

BOTANICAL INFORMATION.

Botanical Society, March 2nd, 1849.

John Reynolds, Esq., Treasurer, in the Chair.

A Paper was read from Mr. A. Henfrey, containing some remarks on the "Discrimination of Species." While estimating highly the value of minute enquiry into the conditions presented by plants, the author could not overlook the inconveniences that arise from hastily giving a specific value to peculiar forms. All the deductions of philosophical Botany depend upon the fixity of Species, as the science of numbers does on the definite nature of units. If we admit transitions, we can only define a Species, as a particular abstract form, more or less completely realized in nature under peculiar conditions which we do not yet understand; but if, as is usually the case, we admit the fixity of Species, we are bound to exercise sufficient care in our observations to avoid raising accidental variations to this rank. In reference to Mr. Jordan's views it was observed, that he also regards the Species as an absolute, and not an abstract form, but on this ground calls every tolerably constant variety a Species.

Mr. Henfrey considered that an important point was overlooked as to the nature of varieties. He regarded them all as abnormal conditions, depending upon the morphological and physiological relations of the different organs. Accordingly he would take that as a true example of a Species in the Phanerogamia in which the seeds (the highest product) were most perfectly and abundantly produced in a generally healthy condition of the whole plant; and from such examples alone, where any doubt existed, should specific characters be drawn. In cultivation, a most important test in doubtful cases, the plants ought to be exposed to many different kinds of condition; otherwise a variety or abnormal form might be continued for a time by the very same influences which first produced it; while the varied conditions would afford the best means of judging of the relative constancy of characters afforded by the different organs of the plant.

PIACABA; *Fibre and fruit of the* COQUILLA NUT, ATTALEA FUNIFERA, *Mart.* TAB. IV.

It is one object of the MUSEUM of the Royal Gardens of Kew,

to collect such specimens of vegetable origin, not exhibited by the living plant, as shall afford information on the different uses that mankind derives from plants. The individual plant to which at this moment we direct attention is one of the *Palms*, the family which perhaps administers most to the various wants of mankind, and is of the greatest importance. A multitude of Palms yield in their fruits a wholesome and nourishing food, as the *Date* and the *Cocoa-nut*, of which latter the Hindoos celebrate in verse the 365 several uses it affords to man. The *Cabbage* of the Palm consists of the young tender leaf-buds of various species. A wine is abundantly derived from some kinds, an ardent spirit and valuable oils from others, while the hard nuts and almost equally hard trunks are employed for innumerable purposes. The Palms yield food, clothing, and materials for building. Those who reside in tropical countries are familiar with these things; and more use is made of Palms even in England than the public are generally aware of, and which we may show probably on future occasions.

At this time we shall allude to one important service rendered by a species of Palm. Few have walked the streets of London without remarking that of late years those streets are, in places at least, kept peculiarly neat and clean, by the stiff fibres of a new material for making brushes and brooms; those of the machines, as well as those employed by hand; and if any one is asked what be the origin of this fibre, the frequent reply is, "whalebone, I suppose." But no; it is not of animal, but vegetable origin, the coarse fibre of a species of Palm, which grows abundantly in Brazil, and is imported to Europe extensively from Pará, tied up in bundles of several feet in length and sold at the price of £14. the ton, under the native name of "*Piaçaba*." A reference to our figure (the reduced representation of the Palm and leaf-stalks [f. 1 and 2] copied from Martius' rare and splendid work on Palms), will show what part of the plant affords this curious material, which according to its stoutness and tenacity is employed for cordage and mats as well as for brooms and brushes. The dilated base of the leaf-stalks separates into a long coarse fringe, which is collected by the natives and used in the country or exported to Europe for the purposes above-mentioned, and now constitutes a considerable article of commerce.

The fruit, or nuts, are another article of commerce, long brought into England under the name of *Coquilla nuts*, and extensively used for various kinds of turnery-work, especially in making the handles of

bell-pulls, umbrellas, &c., &c.; for the shell (or putamen, f. 4) is of great thickness, excessively hard, beautifully mottled with dark and light brown, and capable of taking a high degree of polish. The head of an umbrella-handle is represented thus, at f. 5.

In illustrating these interesting subjects the botanist is necessarily greatly aided by merchants and travellers; and in the present instance we thankfully acknowledge our obligations to two mercantile friends of Glasgow, who have much assisted us by their enquiries and have also supplied specimens for the Museum, W. Gourlie and Michael Connal, Esqrs.

The Royal Gardens possess healthy young Palms of this species, but it is rare in our stoves; for, strange to say, some of the Plants best known in their products (witness the so-called *African Oak*, exported from Sierra Leone, and the so-called *Rice-paper* of China), are least known to botanists and often do not exist in our living collections. Hence it is that, as above observed, we have had recourse to the plates of Martius for our figures 1 and 2. The genus to which *Attalea* belongs, is of the Cocoa-nut group, or division, of Palms, and indeed, the fruit was first figured by Gærtner under the name of *Cocos lapidea*; afterwards by Targioni Tozzetti it was called *Lithocarpus cocciformis*; having reference in both cases to the very hard, almost stony nature of the fruit. Martius changed its name to:—

"*Attalea funifera*; caudice elato frondibus erectis phalerato, petiolorum basibus fibroso-fissis, drupis ellipticis." *Martius, Palm.* p. 136. t. 95, 96. f. 4. and t. T. f. 1, 2.

The stem or caudex is said to attain a height of from twenty to thirty feet, and the leaves or fronds rise to fifteen or twenty feet above that.

TAB. IV. Fig. 1. Represents the general appearance of an entire tree of *Attalea funifera*, greatly reduced. 2. Shows the insertion of the leaf-stalks and the filamentose margins of their bases, on a somewhat larger scale. 3. Entire nut, *nat. size*. 4. Transverse section of the same, showing the thick shell or putamen, and the three cells, of which one or two frequently prove abortive, *nat. size*. 5. Exhibits the head of an umbrella-handle turned from a Coquilla-nut.

Manna (*of the flowering Ash*).

Of the *Manna*, so called, of Scripture, we know nothing further than what we learn from the Sacred Book. If it be analogous to any natural esculent substance which may appear at different seasons, and in greater or less abundance, those writers who refer it to a Lichen (*Lecanora esculenta*) still eaten by some eastern nations, are perhaps not far from the truth.

The *Manna* to which we allude is a sweet concrete exudation well known in medicine, of which samples may be seen in the Museum of the Royal Gardens of Kew; and a fine specimen of the tree which yields it exists in the old Arboretum, very near the largest Deodar. It is the *Fraxinus Ornus* of Linnæus or *flowering ash*, (the *Fraxinus rotundifolia* of Lamarck appears only a trifling variety of the same tree), a native of the South of Europe and Asia Minor; but the Manna seems chiefly to be collected in Calabria and Sicily. The best account we can find of the process of obtaining it is recently given in the American Journal of Science and Arts, extracted from the Archiv. der Pharm. vol. iii. p. 194 of Mr. J. Stettner, who made his observations in Sicily during the summer of 1847. "The *Manna Ash*, *Fraxinus Ornus*, in the Manna districts of Capace, Cinesi, and Fabarotto where the best Manna is obtained, does not form woods, as is commonly supposed, but is cultivated in separate plantations. These plantations generally present regular squares, hedged in with *Cactus Opuntia*. The trees are planted in rows, and are from two to eight inches in diameter, with stems from ten to twenty-five feet high, which from the first shoot are kept smooth and clean. The soil is carefully loosened and freed from weeds. After the eighth year the trees yield Manna, which they continue to do from ten to twelve years, when they are cut down, and young shoots from the roots trained: one root-stalk frequently yields from six to eight new trees and more. For the production of the Manna, young and strong shoots are requisite; but they are not tapped till the tree ceases to push forth any more leaves, and the sap consequently collects in the stem. This period is recognised by the cultivators from the appearance of the leaves; sometimes it occurs earlier than at others, and the collection of the Manna takes place either at the beginning of July or only in August. Close to the soil cross sections are made in the stem, and in the lowermost sections small leaves are inserted, which conduct the sap into a receptacle formed by a cactus leaf: this is the way the Manna *in sorte* is obtained.

The incisions are repeated daily in dry weather, and the longer it continues the more Manna is obtained. The stems are left uninjured on one side, so that the Manna runs down the smooth bark more easily. The next year the uninjured side is cut. The *Manna cannelata* is obtained from the upper incisions, more than forty of which may be counted on one tree. The sap there is not so fat as below, and consequently dries more easily into tubes and flat pieces. After the Manna has been removed from the trees, it has further to be dried upon shelves before being packed in cases. The masses left adhering to the stems after removing the inserted leaves are scraped off, and constitute the *Manna cannelata in fragmentis*. *Cannelata*, *Can. in fragm.* and *Capace* are collected at the same time from one stem—the more *Cannelata*, from the younger, and the more *Capace* or *Gerace*, from the older part of the stem. In Sicily the latter is designated *in sorte*, and is probably the most active. Dry and warm weather is essentially requisite for a good harvest."

NOTICES OF BOOKS.

PLANTÆ FENDLERIANÆ Novæ Mexicanæ,—*an account of a Collection of Plants made chiefly in the vicinity of Santa Fé, New Mexico, by* AUGUSTUS FENDLER; *with Descriptions of the New Species, Critical Remarks, and Characters of other undescribed or little-known Plants from surrounding Regions; by* ASA GRAY, M.D., *(communicated to the Academy of Philadelphia.)*

This is the account of Mr. Fendler's Plants to which we alluded in our February No. p. 62, and of which a copy has just reached our hands. It is, like every thing that emanates from the pen of that talented American botanist, Dr. Asa Gray, a very first-rate production: this, the first part, a 4to of 116 pages, extends only to the end of *Compositæ*. We must refer to the Memoir itself for the many new genera and species, fully and accurately described, and content ourselves with a few extracts relative to the route of Mr. Fendler, communicated by Dr. Engelman, who further prepared enumerations of the *Cactaceæ*, *Cuscutineæ*, *Asclepiadeæ*, *Euphorbiaceæ*, &c., of this collection.

"Mr. Fendler left Fort Leavenworth on the Missouri, in August, 1846, and followed the well-beaten track of the Santa Fé traders to the Arkansas, then up the river to Bent's Fort, where the westerly course was changed for a south westerly one. *Opuntia arborescens* was

first observed in the barren region now traversed; and the shrubby *Atriplex* (n. 709) was the most characteristic and abundant plant, furnishing almost the only fuel to be obtained. Thus far the country was a comparative level, or rather rolling prairie, rising gradually from 1,000 to more than 4,000 feet. On the 27th of September the base of the mountain chain was reached, an outlyer of the Rocky Mountains, and attaining in the Raton Mountains an elevation of 8,000 feet. West of these, in the dim distance, the still higher Spanish peaks appear, which have only been visited very cursorily by the naturalists of Major Long's Expedition in 1820. Scattered Pines are here seen for the first time on the Rio de los Animos, which issues from the Rocky Mountains. Several large perfectly level tracts were crossed, which at this season exhibited no sign of vegetation; while, in other localities of a similar description, nothing could be seen but a decumbent *Opuntia.* The sides of the Raton Mountains were studded with the tall *Pinus brachyptera*, Engelm. (*n.* 381) and the elegant *Pinus concolor* (*n.* 828). Descending the mountains, the road led along their south-eastern base, across the head-waters of the Canadian.

"On the 11th of October Mr. Fendler obtained the first view of the valley of Santa Fé, and was disagreeably surprised by the apparent sterility of the region where his researches were to commence in the following season. The mountains rise probably to near 9,000 feet above the sea-level, 2,000 feet above the town, but do not reach the line of perpetual snow, and are destitute, therefore, of strictly alpine plants. Their sides afford the two Pines already mentioned and *Pinus flexilis*, &c.

"The Rio del Norte, twenty-five or thirty miles west from Santa Fé, is probably 2,000 feet lower than the town, and spring consequently opens earlier there; but its peculiar Flora is meagre. On its sandy banks a few interesting plants were obtained, and others in places where black basaltic rocks rise suddenly from the river.

"South and south-west of Santa Fé, a sterile, almost level plain extends for fifteen miles, which offers few resources for the botanist. *Opuntia clavata* was found exclusively here; besides this, *Opuntia arborescens*, *O. phœacantha*, *Cereus coccineus*, some Grasses, and in some localities the *Shrub-Cedar* (*n.* 834), are the only plants seen on the wide plains. To the west and north-west of Santa Fé, a range of gravelly hills thinly covered with Cedar and the *Nut-pine* (*n.* 830) offers a good botanizing ground in early spring. The valleys furnished

some very interesting portions of Mr. Fendler's collection, and, of *Cactaceæ*, the *Mammillaria papyracantha*, *Cereus viridiflorus*, *C. triglochidiatus*, and *C. Fendleri*.

"But by far the most important locality about Santa Fé is the valley of the Rio Chiquito or Santa Fé creek. It takes its origin about sixteen or eighteen miles north-east of the Town, runs through a narrow channel, and opens into the plain just where the town is built. Most of the characteristic plants of the upper part of the creek and of the mountain-sides are those of the Rocky Mountains, or allied forms; some of which, as *Atragene Ochotensis* or *alpina*, *Draba aurea*, &c., had never been met with in so low a latitude (under 36°).

"Mr. Fendler made his principal collections from the beginning of April to the beginning of August, 1847, in the region just described. At that time unforeseen obstacles obliged him to leave the field of his successful researches. He quitted Santa Fé, August 9th, following the usual road to Fort Leavenworth which separates from the "Bent's Fort road" at the Mora river, and unites with it again at the "Crossing of the Arkansas." The first part of the route from Santa Fé to Vegas leads through a mountainous, woody country, of much botanical interest, crossing the water-courses of the Pecos, Ojo de Bernal, and Gallinas. From Vegas the road turns north-eastwardly over an open prairie country, occasionally varied with higher hills, as far as the Round Mound (6,655 feet high, according to Dr. Wislizenus.) On September the 4th, Mr. Fendler recrossed the Arkansas and reached Fort Leavenworth on the 24th of that month."

Mr. Fendler is about to revisit New Mexico for a more thorough exploration of the Botany of that little-known region, and especially of the higher mountains in the northern and western part of the district; —and heartily do we join Dr. Asa Gray in the expression of his earnest wish that Mr. Fendler may meet with the encouragement he so richly deserves, in the form of additional subscriptions for his collections, which may enable him to re-engage in his arduous undertakings under more favourable circumstances than before.

M. J. Roemer; Familiarum naturalium regni vegetabilis Synopses Monographicæ: *seu Enumeratio omnium plantarum hucusque detectarum* &c. Fasc. I.–IV. Vimariæ, 1845 (?)–1847. 8vo.

It is only very lately that we became aware of the existence of this book, or had seen any portion of it: and now we are unable to

procure the first Fasciculus or to learn the nature of its contents. From the portion before us, it appears intended to publish in succession a Synopsis with, not unfrequently, full descriptions of all the genera and species in each respective order. This would be well, even though the work should be a compilation; for every one must feel the desirableness of having the numerous genera and species now scattered through a multitude of Floras, Transactions, Journals, &c., collected into one complete Catalogue:—and the obligation to the author would be greater, if he would commence with such Orders as most need to have their scattered members so collected, those in fact that have least occupied the attention of systematic botanists as a whole;—the *Monocotyledones*, *Achlamydeæ*, to say nothing of the *Acotyledones*. What the first Fasciculus may contain, as before said, we do not know: the second is devoted to the *Peponiferæ* (*Cucurbitaceæ* and *Passifloreæ*); the third to *Rosifloræ*, Fam. I., *Amygdalaceæ*, and II. *Pomaceæ*; and the fourth fasciculus to *Ensatæ*, Fam. I. *Amaryllideæ*. Now, the labours of De Candolle and of Walpers have brought together pretty well the so-called *Peponiferæ* and the *Rosaceæ*; and the *Amaryllideæ* here are, as may be expected, very much a transcript of Mr. Herbert's work on that family. The author goes all lengths in the establishment of genera, making groups of species, or subgenera of those botanists who have most studied the family, to stand as actual genera: while, instead of giving what are usually called specific characters, the individual species sought is arrived at by a system extremely puzzling to those unaccustomed to such a method.

As a specimen of the work we may observe that under *Pyrus*, by means of an analysis of five divisions, we come to *Pyrus communis*, L.: another division brings us to *Pyrus Achras*, Rch., which latter is accompanied by the observation "ex hisce duabus speciebus orta est" (and then he goes on to enumerate and characterize) fourteen pages closely printed of varieties!

It does not appear that the work has proceeded beyond the fourth fasciculus; nor can we wonder if it has not been patronized by the botanical public. The same degree of industry, better applied, would have produced a book that could not fail to be acceptable to botanists.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

Continued from p. 120.

Calcutta to Darjeeling in Sikkim-Himalaya.

Botanized in the afternoon of the last day of February, under a broiling sun, upon the ridges near the river, but found little novelty. The *Mahoua*, *Olibanum*, *Ehretia*, and *Cochlospermum* (the latter confined to the driest ridges of hills), were all frequent, and streaming with their respective odoriferous gums. The *Catechu*, also, formed every third tree, in some places even more numerous. On the ground, the dwarf Palm was growing in immense abundance, and the woods were, in places, glowing like fire with the red flowers of the *Butea*.

March 1st.—This morning we left the Soane river, and struck inland, over a very hilly country, full 1000 feet below the Kymaor hills, which, as I stated above, recede from the river. They appear to form a vast amphitheatre of rocky precipices, facing the south, and about eight or ten miles broad. The roads, or rather pathways, were very bad, and quite impassible for the carts, without much engineering, cutting through forest, smoothing down the perpendicular banks of the water-courses to be crossed, and clearing away the rocks as we best might. In one place, we traversed the empty bed of a mountain torrent, with perpendicular banks full thirty feet high, and thence plunged into a close forest, abounding with *Zizyphi*, *Catechu*, two other *Acacias*, the *Hardwickia*, with various trees, small *Bauhinias*, a *Pterospermum* (new to me), and the species of Paras Nath, but neither Ferns, Mosses, Lichens, *Orchideæ*, nor other evidences of a moist climate. The direction was towards Mungeza Peak, the grand spur above-mentioned; between which, and a high conical hill, the path defiled. Whether we rode on the elephants or proceeded on foot, the thorny bushes proved most troublesome, and accustomed as we had been to compare ourselves to pincushions at our journey's end, our previous scratchings were nothing to what we sustained this day. The low hills are chiefly round-backed ridges of sandstone, with frequently beds of shale, but no appearance of coal. Peacocks and Jungle-cocks were very frequent, and the squalling of the former con-

tinually resounded in our ears, together with the hooting bark of the monkeys. There were also a few Floricans, (a kind of bustard, the best eating game-bird in India), and innumerable pigeons. From the defile we emerged on an open flat, and saw the advance-tent pitched a few miles off, by the village of Sulkun.

Sulkun is a scattered village, peopled by a bold-looking race, who habitually carry the spear and shield. We had here the pleasure of meeting an English face in Mr. Felle, a gentleman employed in the Revenue department; this being one of the roads, along which the natives transport their salt, sugar, &c., from one province to another.

I spent the afternoon in examining the rocky hill, round whose base we had wound. At its foot runs a small stream, full of *Confervæ*, *Vallisneria*, and a bulbous plant, out of flower: the rocks are green with a *Fissidens* and *Riccia*. These rocks were of stratified limestone, the strata containing large depressed spheres of the same mineral, in horizontal layers, varying from the size of a child's head to much greater dimensions, excessively hard, and not coated or laminated internally. Ascended the hill, which is covered with long grass and low bushes, principally of *Pterospermum* and *Diospyros*.

The narrow, flat top was formed of a thick layer of sandstone rock, perpendicular all round, except at a broken place or two: it was also covered with trees, consisting mainly of the *Cochlospermum* and *Catechu*: the largest were two species of Fig, which clung to the edges, and by forcing their roots in the crevices of the rock, detached enormous cubical blocks, weighing very many tons, which rolled down the hill.

From this summit, the view of rock, plain, forest, and river was very fine. To the North the eye roamed over the undulating plains, bounded by precipitous hills;—West, the Kymaor or Vindhya range rose again in rugged elevations;—South, flowed the Soane, backed by ranges of wooded hills, smoking like volcanos with the fires of the natives. Below, lay the bed of the stream we had left at the foot of the hills, cutting its way through the alluvium, and following a deep gorge to the Soane, which was there hidden by the rugged heights we had crossed, and where the greater part of the camp might be seen straggling on. East, and close above us, the bold spur of Mungeza shot up its retiring faces, forming a continuous stretch of red precipices, clothed with forest down to their bases, and over their horizontal tops.

From Sulkun the far-famed view of the fort and palace of Bidjegur

is very singular, planted on the summit of an isolated hill of sandstone, about ten miles off; whose sides appear, as seen from hence, to be perpendicular all round. A large tree by the palace marks its site; for, at this distance, the buildings are undistinguishable.

There are many tigers on these hills; and as one was close by, and had killed several cattle, Mr. Felle kindly offered us a chance of slaying him. Bullocks are tethered out, over-night, in the places likely to be visited by the brute: he kills one of them, and is from the spot tracked to his haunt, by natives, who visit the stations early in the morning, and report the whereabouts of his lair. The sportsman then goes to the attack mounted on an elephant, or having a *roost* fixed in a tree, on the trail of the tiger, and he employs some hundred natives to drive the animal past the lurking-place.

On the present occasion, the locale of the tiger was doubtful; but it was thought that by beating over several miles of country he might (or at any rate, some other game might) be driven past a certain spot. Thither, accordingly, the natives were sent, who built machans (stages) in the trees, high out of danger's reach; Mr. Theobald and myself occupied one of these perches in a *Hardwickia* tree, and Mr. Felle another, close by, both on the slope of a steep hill, surrounded by jungly valleys. We were also well thatched in with leafy boughs, to prevent the wary beast from espying the ambush, and had a whole stand of small arms ready for his reception.

When roosted aloft, and duly charged to keep profound silence, which I obeyed to the letter, by falling sound asleep, the word was passed to the beaters, who surrounded our post on the plain-side, extending some miles in line, and full two or three distant from us. They entered the jungle, beating tom-toms, singing and shouting as they ascended, and converging to our position. In the noonday solitude of these vast forests, our situation was romantic enough: there was not a breath of wind, an insect or bird stirring; and the wild cries of the men, and hollow sound of the drums broke upon the ear from a great distance, gradually swelling and falling, as the natives ascended the heights or crossed the valleys. After about an hour and a half, the beaters emerged from the jungle under our retreat; one by one, two by two, but preceded by no single living thing, either mouse, bird, deer, or bear, and much less a tiger. Mr. Theobald caught a fever, from letting his sleeping head droop from out of the shade under

a burning sun; and so ended our tiger-hunt! The beaters received afterwards about a penny a-piece for the day's work; a rich guerdon for these poor wretches, whom necessity sometimes drives to feed on rats and offal.

We were detained three days at Sulkun, from inability to get on with the carts; and as the pass over the Kymaor to the north (or the way to Mirzapore), was to be a still worse task, I took advantage of Mr. Felle's kind offer of camels and elephants to make the best of my way forward, accompanying that gentleman, *en route*, to his residence at Shahgungh, on the table-land.

I found nothing to remark on this curious flat; the weather and the botany being similar to what I had experienced in the Soane valley, from which it is but a few miles removed. The crops were wretched, and there was barely a good tree on the plain. The dryness of the atmosphere is excessive; the most familiar instance of which that I can give you is that my comb, a very strong tortoise-shell one, fell into five pieces in ordinary use.

Though so poor, the natives are far from honest; for they robbed one of the tents placed between two others, wherein a light was burning and three gentlemen lay. One was broad awake, with his back to the light, when turning round accidentally, he saw five men at his bedside, who escaped with a bag of booty, in the shape of clothes, and a tempting strong brass-bound box, containing, however, nothing but private letters. The clothes they dropped outside; but the letters are kept, perhaps, till they learn how to read them! There were about a hundred camp-people asleep outside the tents, close to the ropes, between whose many fires the rogues must have passed, eluding also the vigilance (?) of the guard, who were, or ought to have been, awake.

March 3rd.—Bade adieu to Mr. Williams and his kind party, whom I hoped to see at Mirzapore, before I should leave, and rode to the Ghaut, passing over a plain to the village of Markounda, at the foot of the Ghaut. There the country becomes very rocky and wooded, and a stream is crossed, running over a flat bed of limestone, cracked up into the appearance of a tessellated pavement, the interstices filled with volcanic (?) matter.

For many miles on either side, this is the only ascent of the range, and is evidently a *fault*, or shifting of the rocks, producing so broken

a cliff as to admit of a path winding over the shattered crags. This pass is called "Ek powa-Ghat," very significantly, for it means "one foot Ghaut." It is covered with brushwood, clinging to the cliffs and crags, very abrupt and rocky. On either side the precipices are extremely steep, of horizontal rocks, continued in an unbroken line; and the views over the plain and Soane valley, over which the sun was now setting, were superb. Bidjegur to the south-east, and the bold crag of Mungeza, the Vindhya hills south-west, and the broad area of the amphitheatre at our feet, either naked, or covered with low jungle, or partially cultivated. At the top we emerged on a dead flat plain, or table-land, quite level, except at the crest of the pass and along the verge of the precipices, where it is broken into rocky hillocks, or broad pyramids of flat slabs of coarse-grained sandstone. By dark we reached the village of Roump, beyond the top of the pass, and arrived at a small tent which Mr. Felle had pitched for us.

March 4th.—Mounted a small, fast, and woefully high-trotting elephant, and started for Mr. Felle's Bungalow, at Shahgungh. The country here is totally unlike that below, and though higher, yet, owing to the better soil and abundance of water, it is more fertile. Miles are covered with Rice-fields, irrigated from wells, whence the water is drawn by long swing-poles and buckets, as we see in Holland and at Yarmouth, with which locality, for dead flatness, the country may be compared. Tanks, too, are numerous. Scattered topes of Mango and Tamarind everywhere meet the eye, indicating villages, which are all, however, poor and small.

This table-land, you must remember, is a continuation of that at Rotasghur, but not quite so high (that being 1800 feet, and this 1300), and very little below the common level of Behar. Here the country is a dead flat, with no hills, and the strata are horizontal beds of sandstone. Behar, again, is formed of highly inclined gneiss, and similar primitive rocks, either elevated above the mean level into ridges, or starting up in bold mountains like Paras-Nath. How curious it is, that the mean elevation of these two totally different and widely distant plateaux, should be the same! Of the main differences in their vegetation, the cause must be sought in the soil. A flat ledge of sandstone here retains the moisture, and gives rise to no rivers that shall wash away the alluvium. The inclined beds of crumbling gneiss or

splintered quartz, of the Behar hills, drain off the superficial moisture, while the undulating surface allows of water-courses, and offers every facility for the removal of the alluvium. For these reasons, though the atmosphere may be equally dry in both places, the soil is far from being so; witness the abundance of wells and tanks here, and their rarity in Behar. The copious effloresced salts of the latter country, which are indicative of gneiss in many parts of India, are an additional promoter of sterility.

Upon soil and surface of this nature, I saw neither *Catechu*, *Olibanum*, *Butea*, *Diospyros*, *Terminalia*, Dwarf Palm, nor any of the characteristic plants of Behar, which had accompanied me from the Dunwah, through all countries where the rock was superficial, and irrespectively of the chemical nature of these rocks, whether primitive, volcanic, limestone, or sandstone: the vegetation rather resembled that of the flat banks of the Ganges, but too lofty for good trees of Peepul and Banyan, or for the Banana and Sugar-cane to grow. The *Acacia Arabica* is common here, and I believe rare to the eastward of this meridian; for I saw little of it in Behar. It is a plant very partial to a dry climate, and indifferent, in a great measure, to the soil. Its distribution seems governed by the same laws as affect the camel, its constant companion over some thousands of leagues of longitude. Neither of them flourishes east of the Soane river (to the south of the Himalaya, at least), below the mouth of which, on descending the Ganges, a marked change in the humidity of the atmosphere is experienced.

Mango, which is certainly *the* fruit of India, as the Pine-apple is of the Eastern Islands, and the Orange of the West, is now blossoming, and a superb sight it is. The young leaves are purplish-green, and form a curious contrast to the deep lurid hue of the older foliage; especially when the tree is (which often occurs) dimidiate, one half the blue, and the other the red series of colours; when in full blossom, all forms a mass of yellow, diffusing a fragrance rather too strong and peculiar to be pleasant.

We passed a village, where a large fair was being held, and singularly familiar were its arrangements to my early associations. The women and children are the prime customers; for the latter whirl-you-go-rounds, toys, and sweetmeats were destined; to tempt the former, little booths of gay ornaments, patches for the forehead, ear-rings of quaint shapes,

bugles and beads. Now here, as at home, I remarked that the vendors of these superfluities occupy the approaches to this Vanity-Fair: no doubt at the instigation of the insinuating branches of the families of buyers, who thus secure their partners' or parents' visit to this department, when his purse is yet full. As, throughout the East, the trades are congregated into particular quarters of the cities, so did the itinerants here group themselves into little bazaars for each class of commodity. Whilst I was engaged in purchasing a few drugs and trifling articles of native workmanship, the elephant made an attack on a lollypop stall, and demolished a magnificent erection of barley-sugar, that would have done credit to Gunter's shop or almost to a nobleman's dessert-table.

Mr. Felle's house occupies a hill on the plain, and is, in fact, built upon the site of an old fort, still surrounded on three sides by a moat. A neat garden adorned with Mignonnette, Sweet-Peas, and Roses, was a pleasant sight in the wilderness, though not so attractive to me as the water-plants which filled the moat. In this, which is half supplied by spring-water, grew the *Nymphæa Lotus*, *Damasonium Indicum*, three species of *Potamogeton* (one is *P. natans?*), *Aponogeton*, *Villarsia cristata*, (the flowers small and not crested), *Chara*, *Zannichellia*, and two species of *Naias*. These three tufted aquatic genera are used indifferently or together, in the refinement of sugar by the natives. In a large tank hard by, and wholly supplied with rain-water, I observed only the crested *Villarsia*, no *Aponogeton*, *Nymphæa*, or *Damasonium*, and so with other rain-water tanks, which, though well peopled with plants, contained none of the above four. This is probably owing, either to some property in the water, or to these plants disliking the greater changes of level in the pluviometers.

The country all around is a dead flat, several feet under water during the rains. The only rise I saw was south, in the direction of the Ghauts; and thither I posted towards a natural tank, situated in the low hills. For the first five miles the paths are through rice-fields, and a country similar to that passed over yesterday; but, on nearing the Ghauts, the flat beds of sandstone rise to the surface, and immediately a low forest jungle commences, consisting of all the trees of the Soane and plains of Behar, a convincing proof of the mechanical, and not the chemical properties of the soil influencing their distribution. As I passed from the

rocky ledge to more broken ground, the *Olibanum*, *Catechu*, *Diospyros*, *Terminalias*, *Phyllanthus*, *Emblica*, and a host of old friends of the Dunwah pass, greeted me.

Rajub-bund, or "the pleasant spot," is the fitting name of this little loch, which is a tarn in a depression of the sandstone rocks, surrounded on three sides by little cliffs, and covered with the brushwood of the above-mentioned trees. It is a wild and pretty place, much like some birch-bordered, rocky pool in Scotland or Wales, sequestered and picturesque. Here again the *Aponogeton*, and not crested *Villarsia* appeared, with several *Potamogetons*, *Chara*, *Zannichellia*, and a floating *Utricularia*. It was dark before I got back, with heavy clouds and vivid lightning approaching from the south-west. The day had been very hot (Ther. at 3 o'clock P.M., 90°), the evening too; but the barometer did not foretell the coming tempest, which broke with fury at 7 P.M., blowing open the doors, and accompanied with vivid lightning and heavy thunder, close by and all round the town, though not one drop of rain fell. It lasted only an hour, passing on to the north-east.

Euphorbia ligulata is commonly used here for hedging, and on examining its thick succulent stems, I was surprised to find the pith septate, as in the young wood of the Wallnut. This reminds me that Brongniart refers some of the characteristic coal-plants to *Euphorbiaceæ*; and a cast of the axis of an ill-understood accompanying plant in the coal-measures presents a septate pith, and has, on these slender grounds, been placed in the same Natural Order with *Juglans*. I shall look for septate piths now: there is no cause to suppose them rare.

In the clear dry mornings of these regions, a curious optical phenomenon may be observed, of a *sunrise* in the *west*, and *sunset* in the *east*. In either case, beautiful and well-defined beams rise from the horizon to the zenith, often crossing to the opposite horizon. It is a beautiful feature in the firmament, and equally visible, whether the horizon be cloudy or clear, the white beams being projected against a dark vapour or the blue serene indifferently. The zodiacal light shines from an hour or two after sunset till midnight, with singular brightness, almost excelling the milky way.

On the Genus Atropa; *by* John Miers, Esq., F.R.S., F.L.S., &c.

Atropa.

On a former occasion I have alluded to the marked feature of the imbricate æstivation of the corolla in this genus, as a character quite incompatible with its position among the *Solanaceæ*, and have therefore arranged it along with several others in a distinct tribe, *Atropeæ*, (Ann. Nat. Hist. n. Ser.) forming one of many groups, which I have associated in a separate family or sub-order, whose peculiar features are there delineated. This genus has hitherto been so very indistinctly defined, and its limits so little understood, that it has served as a receptacle for many heterogeneous plants belonging to *Solanaceæ*, so that out of the numerous species placed in it by various authors, I can find only one remaining, the well-known *Atropa belladonna*. I have, however, met with, cultivated in our gardens, another species which, although indicated, has never before been fully described. In order to remove the confusion hitherto existing in this genus, I have collected together all the plants placed by botanists in *Atropa*, with a reference to the several genera to which they are now properly referrible. The following is offered as a more correct outline of the features of the genus, the details of which, with some few exceptions, are very faithfully delineated by Nees v. Esenb. Gen. Pl. Fl. Germ. (Gamopet. vol. i.) in his analysis of *Atropa belladonna*.

Atropa, (Char. emend.)—*Calyx* urceolato-campanulatus, 5-partitus, laciniis duplo-triplove tubo brevissimo longioribus, acutis, erectis, augescens, demum stellato-patens. *Corolla* infundibuliformi-campanulata, limbo brevi, 5-partito, laciniis oblongis, obtusis, æstivatione imbricatis. *Stamina* 5, æqualia, inclusa; *filamenta* imo corollæ adnata, basi crassiuscula, fornicata, lanata, superne subulata, apice subito inflexa; *antheræ* ovatæ, deflexæ, 2-lobæ, lobis parallelis, sine connectivo medio nexis. *Ovarium* ovatum, conicum, disco carnoso 4-lobo impositum, 2-loculare, placentis cum dissepimento cruciformibus mox lunatis incrassatis, ubique ovuligeris. *Stylus* filiformis, apice inflexus, et incrassatus. *Stigma* subglobosum, labiis 2 transversis compressis glandulosis signatum. *Bacca* globosa, 2-sulcata, 2-locularis, calyce patente suffulta. *Semina* plurima in pulpam nidulantia, reniformi-ovata, subcompressa, testa favoso-scrobiculata, hilo sublaterali.

Embryo teres, in albumen subcarnosum subspiraliter arcuatus, *radicula* angulam basilarem spectante, *cotyledonibus* semiteretibus sublongiore.—Herbæ *perennes* Europæ et Asiaticæ, *caulescentes*, foliis *geminatis*, *integerrimis*, pedunculis *extra-axillaribus*, *solitariis*, 1-*floris*, corolla *flavescente vel lurido-violacea*.

1. Atropa *belladonna*, Linn. Nees Gen. Fl. Germ. [icone optimo] :—caulibus erectis, dichotomis ; foliis geminatis, altero dimidio minore, late ovatis, versus apicem acuminatis, acutis, basi rotundatis et in petiolum longum repente cuneato-attenuatis, glaberrimis ; pedunculo pubescente, florifero pendulo, fructifero erecto, elongato, apice incrassato ; corolla lurido-violacea, filamentis imo sparse pubescentibus.—Europa.

The leaves of this plant are generally from five inches and a half to seven inches long, including the petiole, and three inches and a quarter broad.

2. Atropa *acuminata*, Royle. *Ill. Bot. Him.* 279. *Journ. Hort. Soc.* vol. i. p. 306. (n. sp.) :—caulibus erectis dichotomis ; foliis geminatis, altero tertio minore, oblongo-ellipticis, longe sensim acuminatis, imo in petiolum gradatim attenuatis, glaberrimis ; corolla majora, viridescenti-lutea, filamentis imo dense lanatis.—Mongolia. —*v. s. in Hb. Lindley* (Munro) *v. v. cult. in hort. Kewensi.*

In this very distinct and hitherto undescribed species, the corolla is considerably larger and broader, of a greenish yellow colour, and of thinner texture ; the filaments are densely cottony at their insertion. The leaves are seven inches long, including the petiole, and two inches and a quarter to two inches and three-quarters broad, they are very distinct in their form from that of the common *Belladonna*, being much narrower and very much tapered at both ends. It was introduced into this country from seeds sent from Chinese Tartary, by Captain Munro, in April, 1845, and the plants were first reared in the gardens of the Horticultural Society. The exact locality of its origin is not given, but it is stated to grow at a height of 12,000 feet.

I have little doubt that other species exist which have been confounded with our common *Belladonna*. The plants brought from the eastern extremity of Europe bordering upon Asia, appear to me intermediate between the two species above described, their leaves are more acuminated than those of our British plant, but the specimens I have seen are too few and unsatisfactory to identify the specific points of

difference. A specimen I have seen from Sicily also appears to me specifically distinct, but in the absence of more satisfactory materials, I do not attempt to say more on the subject.

The following is the list of excluded species, with their present references above alluded to :—

Atropa *viridiflora*, H.B.K.	..	Hebecladus *viridiflorus*, Nob.
—— *flexuosa*, Willd.	..	—— *idem.*
—— *umbellata*, R. & P.	..	—— *umbellatus*, Nob.
—— *revoluta*, Dietr.	..	—— *idem.*
—— *villosa*, Zeuch.	..	—— *idem.*
—— *biflora*, R. & P.	..	—— *biflorus*, Nob.
—— *erecta*, Hornem.	..	—— *idem.*
—— *bicolor*, R. & P.	..	—— *bicolor*, Nob.
—— *aspera*, R. & P.	..	—— *asperus*, Nob.
—— *glandulosa*, Hook.	..	Salpichroma *glandulosa*, Nob.
—— *dependens*, Hook.	..	—— *dependens*, Nob.
—— *hirsuta*, Mey.	..	—— *hirsuta*, Nob.
—— *rhomboidea*, Hook.	..	—— *rhomboidea*, Nob.
—— *spinosa*, Mey.	..	Lycioplesium *meyenianum*, Nob.
—— *arborea*, Willd.	..	Acnistus *arborescens*, Schl.
—— *arborescens*, Linn.	..	—— *idem.*
—— *frutescens*, Plum.	..	—— *Plumieri*, Nob.
—— *sideroxyloides*, Willd.	..	—— *sideroxyloides*, G. Don.
—— *arenaria*, Willd.	..	Nectouxia *formosa*, H.B.K.
—— *aristata*, Poir.	..	Withania *aristata* Pauq.
—— *erecta*, Zeuch,	..	—— *frutescens*, Pauq.
—— *frutescens*, Willd.	..	—— *idem.*
—— *biflora*, Pers,	..	Saracha *biflora*, R. & P.
—— *contorta*, Pers.	..	—— *contorta*, R. & P.
—— *dentata*, Pers.	..	—— *dentata*, R. & P.
—— *plicata*, Roth.	..	—— *procumbens*, R. & P.
—— *Rothii*, Poir.	..	—— *umbellata*, DC.
—— *umbellata*, Roth.	..	—— *idem.*
—— *mandragora*, Linn.	..	Mandragora *vernalis*, Bertol.
—— *idem*, Sibth.	..	—— *officinarum*, Bertol.
—— *origanifolia*, Desf.	..	Physalis *curassavica*, Linn.
—— *physaloides*, Linn.	..	Nicandra *physaloides*, Gaert.
—— *punctata*, Pers.	..	Pæcilochroma *punctata*, Nob.

—— *Solanacea*, Linn.	..	Solanum *aggregatum*, Jacq.
—— *hirtella*, Spr.	..	—— *gracillimum*, Sendt.
—— *herbacea*, Mill.	..	Ignota.

On ANATROPAL *and* ORTHOTROPAL OVULES; *by* BENJAMIN CLARKE, Esq., (Pl. V. A. B.)

As the orthotropal and anatropal states of the ovule are generally considered to have an influence in determining the affinities of natural orders, the discovery of ovules, in both these conditions, growing on the same placenta, will, I trust, be regarded as an interesting fact (Vide Tab. V. A). The plant in which this unusual structure occurred was *Tellima grandiflora*; and the flower in which it was observed was at the base of a raceme, and had arrived at a state of maturity, having begun to expand itself. No other variation from the usual structure existed in any part of the flower; and the ovules were viewed in different aspects for the purpose of verification.

An inference which appears deducible from this singular circumstance is, that the orthotropal and anatropal states of the ovule are of less value in separating orders than has by some botanists been supposed. The ovules vary from orthotropal to anatropal in several natural orders, as for example *Sterculiaceæ*, *Palmaceæ*, &c.; and the same difference taking place in the ovules of a single flower, offers an additional reason for concluding that orders, otherwise in affinity, should not be considered as distant from each other, from the want of correspondence in the structure of their ovules, such as *Frankeniaceæ* and *Silenaceæ*, *Urticaceæ* and *Nyctaginaceæ*, *Urticaceæ* and *Chenopodiaceæ*, and even *Papaveraceæ* and *Cruciferæ*, notwithstanding the absence of albumen in the latter order.

I have also observed another departure from ordinary structure in the ovules of a monstrous ovary of *Matthiola incana*, the ovules of which are campylotropal. In this instance one ovule was distinctly orthotropal, and another apparently so (Vide Plate V. B.) Such a deviation occurring in a monstrous ovary, I should not, as a single instance, have thought worthy of much attention, the ovules being also very small comparatively with the ovules usually formed (not equal in size as in the *Tellima*), but, from the case of the *Tellima*, it seems

probable that had these two ovules been fully developed, they would still have retained their form as represented.

The monstrous ovary I have reason to conclude, by having compared it with other monstrous ovaries of *Matthiola incana*, arises from the confluence of *three* flowers, a kind of structure not uncommon, and taking place to the extent of two flowers in plants of other orders. The free portion on one side is an ovary, having but a single cell, which is ruptured at its upper part by a process-like dehiscence, and on the margins are seen the ovules. The additional ovary on the other side is yet more imperfectly developed, and adheres to the back of the central ovary, which has become partially fissured in consequence; a frequent occurrence in the monstrous ovaries of this plant.

Explanation of the figures, Plate V. :—

A. Fig. 1. Anatropal and Orthotropal ovules growing on a placenta of *Tellima grandiflora*; f. 2. an orthotropal ovule; f. 3. an anatropal ovule :—*all much magnified.*

B. Fig. 1. A monstrous ovary of *Matthiola incana*; f. 2. section of the ovary showing the free portion to consist of but one cell; f. 3. section of the upper part of the free portion of the ovary, on the separated margins of which the ovules are seen :—*all much magnified.*

On some Chinese Plants.

1. *Remarks on a proliferous leaf of* Chirita Sinensis; *by* H. E. Hance, Esq. (Plate V. C.)

Whilst botanizing in the island of Hong-Kong, I discovered a specimen of *Chirita Sinensis*, Lindl.,* producing young leaves in abundance

* At least I presume it to be that species, of which, however, I have not seen any description, and am consequently uncertain. The following brief diagnosis was drawn up from living specimens :—

C. foliis omnibus radicalibus ellipticis inæqualiter serratis subtus pallidis in petiolum folio 2–4-plo breviorem attenuatis, scapis 3–5-floris, bracteis ovatis connatis pedicellos subæquantibus, calycis 5-partiti lobis ovato-lanceolatis corolla multo brevioribus.

Ad insulæ Hongkong Sinarum rupes humidas umbrosas, ripasque torrentium semper madidas. Fl. Aug. Sept. Herba semi-pedalis passim villoso-pubescens. Corolla pollicaris cærulescens, intus lineis maculisque flavo-aurantiacis notata.

[It seems to be a narrow-leaved variety of *C. Sinensis*, of Dr. Lindley.—Ed.]

from the surface of a mature one. They varied in length from two lines to an inch, and followed no symmetrical arrangement, but sprang indiscriminately from the costa, primary veins, and connecting parenchyma, and threw out fibrils which emerged from the under side of the leaf.

Amongst the various instances on record of the presence of adventitious buds on the leaves, nearly all, as in the well-known example of *Bryophyllum*, where the phenomenon is normal, agree in the fact that they are produced from the margin. The case recorded by Poiteau and Turpin of *Ornithogalum thyrsoides*, and especially that of the *Drosera*, observed by M. Naudin, (vide Moquin Tandon, Térat. vég. p. 237, and St. Hilaire, Leçons de bot. p. 222), closely resemble the present one, which, however, I think it will be admitted, is far more remarkable, by the abundance and well-developed state of the adventitious leaves. The leaf from which they sprang was partly discolored, and in an incipient state of decay, particularly the under surface, from constant exposure to wet; the plant growing only in rocky ravines, down which water is incessantly falling in cascades. I have considered the present example worthy of publication, not only as being one of the most remarkable of the kind hitherto recorded, but also because I think it calculated to support in some measure the opinion of those who contend for different modes of placentation. The placentæ of the group to which the plant under consideration belongs, arise from the axils of the carpels, but (see Brown in Horsfield, Plant. Jav. rar. pt. ii) dividing into two lobes, the ends of which are recurved. But while the marginal theory would appear to be untenable as universal, the same must probably be said of those propounded by Endlicher and Link (Vide Reports on Botany, Ray Society, 1846, p. 378). The Orders *Geraniaceæ*, *Nymphæaceæ*, *Fabaceæ*, and *Orchidaceæ*, seem, indeed, to present so many distinct modes of placentation; and I trust that the actual example may tend to strengthen the views of those who are inclined to admit diversity in the local origin of ovules, in like manner as they are compelled to accord it to buds. A representation of the irregularity is annexed. (Vide Plate V. C.)

2. *Description of a new Genus of* ACANTHACEOUS *plants* of China; *by* H. F. HANCE, Esq.

GUTZLAFFIA, *Hance.*

Calyx regularis, quinquefidus, laciniis angustis. *Corolla* e tubo

longulo curvato campanulata, limbo æquali quinquefido, laciniis ovatis obtusis. *Stamina* duo sub-inclusa; *antheræ* ovales, biloculares, locellis parallelis, æqualibus, muticis.—*Stylus* in canali faucium barbato reconditus, exsertus, apice incurvus; *stigma* simplex, subulatum. *Capsula* oblonga sub-quadrangularis, bilocularis, tetrasperma, loculicide bivalvis, valvis medio septiferis; *dissepimentum* adnatum, completum. *Semina* orbiculata, compressa. Suffrutex *Sinensis*, foliis *integerrimis*. Flores *in fascicula cymosa axillaria et terminalia, vel, si mavis, capitula, congesti, bracteis suffulti, nutantes. Genus sat distinctum, hinc* Endopogoni *illinc* Codonacantho *affine, eisque interjacens. Dicatum sinologo indefesso et eruditissimo* CAROLO GUTZLAFF, *Theol. Doct., scientiarum artiumque in imperio cœlesti conditionis facile studiosorum principi.*

Gutzlaffia *aprica*; caule sub-diffuso tetragono scabriusculo, ramis erectis, foliis ellipticis basi in petiolum brevem abeuntibus integerrimis costato-venosis sub-rugosis supra margineque scabris subtus (costa venisque exceptis) dense incanis, fasciculis 5–8-floris sessilibus, bracteis lanceolatis sub-tomentosis ciliatis calycem parum superantibus.—Planta pedalis in insulæ Hongkong Sinarum locis aridis solatis degens.

Fl. Nov.–Dec.—Corolla semi-pollicaris lilacina speciosa.

3. *Description of a new* CERASTIUM; *by* H. F. HANCE, Esq.

Cerastium *petiolare* (§ Orthodon, *Endl.*); sparse pilosum, caulibus diffuso-prostratis, foliis triangulato-ovatis subcordatis acutis longe petiolatis, floribus paucis, sepalis lanceolatis pilosis, petalis calycem vix superantibus bipartitis, staminibus 8–10, stylis 4–5, capsula calyce paulo longiore.

HAB. In ins. Hongkong.

Adnotatio. In diagnosi quam olim scripsi novæ Dianthi speciei (D. Morrisii), verba *tubo calycis duplo brevioribus*, non petala ad integra, sed eorum modo laminas attinentia, delenda—quoniam ansam præbent ideæ falsissimæ veræ petalorum longitudinis, quæ calycem valde superant.

BOTANICAL INFORMATION.

Note on the recent Voyage of H.M.S. *Herald*; *by* Mr. B. Seemann.

[As a possible means of rescuing Sir John Franklin and his brave companions from the perilous situation in which there is too much reason to fear they are placed, it is well known that H.M.S. Herald, Captain Kellett, then and still on a surveying voyage in the Pacific, was instructed last year to proceed to Kamtschatka, to procure whatever necessary aid that country might afford, and to communicate with H.M.S. Plover, in Behring's Straits, whence the latter was to proceed eastward, in the hope of falling in with the party. We have just received, from the zealous naturalist of the Herald, the following notes of the voyage, which cannot fail to interest our readers.—Ed.]

The Herald left the Island of Taboga, in the Bay of Panama, on the 9th of May, 1848, and, having sighted the Sandwich Islands, arrived, after a tedious voyage of ninety-two days, at the port of Petropaulowski, in Kamtschatka.

Great was my surprise, when first I beheld the vegetation of Awatscha bay, to find, instead of naked hills and sterile plains, as I had anticipated, a luxuriant herbage, reaching as high as to the line of perpetual snow of the numerous volcanoes, a brilliant green presented itself; for it was August, the height of summer. Nearly everything was in flower, and beautiful it was to see the road-side covered with blue Geraniums, Kamtschatka Roses and Lilies, intermixed with *Pedicularis* and the white blossoms of *Spiræas* and *Actæas*. Only two kinds of trees are found, viz., *Pinus Cembra*, and *Alnus incana*; for the *Pyrus rosæfolia*, called by Chamisso a tree, cannot rank as such, as it never grows higher than eight or ten feet. The *Alnus* is the most common. The whole town of Petropaulowski is built of its wood: it also furnishes the principal fuel of that place. Of its bark the Kamtschadales manufacture vessels for holding fluids, called here, as over all Siberia, *Tujes* (one of which I transmit for the Museum). Bread made of the bark of the same tree is not used at Petropaulowski, but is still eaten by the natives of the interior. The few Willows growing in the bay are only shrubby.

If nature has been scanty in supplying larger ligneous plants, she has fully made up for it in the distribution of perennials; nearly all the plants I collected were such: annuals seem to be scarce on account of the short duration of the summer, and the suddenness with which the cold season sets in, which undoubtedly must prevent a great many seeds from arriving at maturity. Among the officinal plants Kamtschatka produces, the following are deserving of notice. The *Schelamanik*, or *Intoxicator* (*Spiræa Kamtschatica*, Pallas), is a fine perennial, attaining not uncommonly the height of six or eight feet, and producing a corymb of conspicuous white flowers. A strong liquor is prepared from its root, although prohibited by the laws of the country. In the spring the young shoots, which have strong astringent properties, constitute, when mixed with fish or seal-oil, a favourite dish of the inhabitants. The young leaves of *Ligusticum Scoticum* are boiled and eaten, (as those of *Urtica dioica* and *Ægopodium Podagraria* in Germany,) and in Kamtschatka and other parts of Siberia, the plant is called *Marschownik*, and by some *Slatkaja trawa*, signifying *Sweet herb*. A species of *Boletus*, vernaculary termed *Guba*, is made into tinder, and, when burnt, its ashes are used instead of snuff.

The soil in the Bay of Awatscha consists everywhere of the richest vegetable mould; but, in spite of this advantage, agriculture is still in its infancy. The inhabitants live almost entirely on wild berries and fish, especially herrings and salmon. It is only around their houses that little patches, cultivated with potatoes, cabbage, radish, lettuce, and turneps are met with. The cabbage and turneps are excellent, but the potatoes are very watery, probably the soil is too rich.

All the plants collected in Awatscha Bay amount to one hundred and thirty; but I do not think there are many, if any, new species amongst them. There is, however, a considerable number different from those enumerated in the Botany of Beechey's Voyage, which certainly, considering they were gathered in such a hurry, leads to the conclusion that there still exist many unknown to us. But if the coast affords such riches, what must not the interior of the peninsula produce?

Gladly would I have undertaken a journey with this object, but my present situation is unfavourable for such explorations. Our stay in port is always very short; and even if I get leave for any time, it is so limited, that the expences, on account of the quickness with which

everything has to be done, and the great sacrifices of money one has to make, appear to me to exceed the value of the collections obtained. A Russian naturalist, Mr. Bornasensky, has been travelling for the last three years in Kamtschatka. He did not collect in Botany, but has brought together an immense mass of zoological objects for the Imperial Museum of St. Petersburg. I regret not to have seen him, as he would have been able to give me a great deal of information about the interior. During our first visit, he was at some inland place, and when we called in for the second time, he had sailed for Europe.

Our stay in Awatscha Bay was short. On the 14th of August we set sail, and reached Norton Sound, North-west America, on the 2nd of September. The motives for going to that place were to obtain an interpreter for the Esquimaux language, in Kotzebue Sound. The business being urgent, and the weather very boisterous, only one boat went to the Fort of St. Michael. I had no opportunity to land; and the few plants occurring in the Herbarium I owe to the kindness of Captain Kellett to whom they were brought off.

On the morning of the 4th of September, the voyage was resumed, and on leaving the Sound I perceived, through the telescope, large groves of Coniferous trees. After an exciting passage through Behring's Straits, in which we encountered thick fogs, we anchored on the 14th of the same month off Chamisso Island, in Kotzebue Sound. Here the arctic winter was fast approaching, all the Esquimaux had left, and several severe night-frosts had already destroyed the tender herbaceous vegetation, leaving only the hardier children of Flora, the Lichens, Mosses, and Evergreens, to the disappointed collector.

There is a striking difference between the vegetation of Awatscha Bay, and that of Kotzebue Sound. Trees no longer adorn the soil: all ligneous species are low and dwarfy. The *Betula incana* of Kamtschatka, there a noble tree, is here transformed into low bushes. The *Salices* have sought shelter on the slope of hills having a southern aspect, where also the greater part of the herbaceous vegetation abounds. There is nothing interesting in such a landscape, nothing to arrest the eye, nothing to interrupt the monotony of the scene: a grey peaty surface covers hill and dale. *Betula nana*, *Sedum palustre*, *Arctostaphylos alpina*, *Andromeda polifolia*, and *Vaccinium uliginosum*, hardly raise their heads above the surrounding lichens and mosses. The

numerous little lakes and pools, peopled by flocks of wild geese, have their margins lined with beds of *Carex* and *Eriophorum*, while the sea-shore abounds in several *Algæ*, and heaps of drift wood. This drift wood, consisting of fir and beech, is probably carried down Buckland River, and must have grown far inland. Some of the largest stems of fir I measured, and found them forty feet long, and two feet in diameter.

During our stay in the Sound, an excursion was made to Escholtz Bay, to collect fossils, which was crowned with complete success. On the cliffs, in which the Mammoth bones are found, many theories have been advanced. I, for my part, came to the same conclusion as did Kotzebue; viz., that the interior of the cliffs is pure ice (which was shown by several portions of the cliffs having fallen down), that this ice is covered with a layer of clay, containing the fossils, and surfaced by the everywhere prevailing peat. The peat bears the vegetation above described, which shows that it is possible for a plant to grow in a soil deep frozen beneath the surface; a fact formerly much disputed.

To obtain an interview with the Esquimaux, the Captain resolved to take the ship up to Cape Kruzenstern, but there, as everywhere, the Esquimaux had retired to their winter-quarters. Though circumstances again prevented my landing, I obtained a few Cryptogamiæ, brought to me by our first-lieutenant, Mr. Macguire. Returning again to Chamisso Island, we fortunately met a party of natives, and learned from them that no ship had been in the Sound, but that some "white men" were travelling in the interior; this information opened a field for various conjectures: some concluded them to be Sir John Richardson and his party.

We remained upwards of a fortnight in this region, awaiting the arrival of H.M.S. Plover; but that vessel not making her appearance, and there being sufficient proof of the quick approach of winter, a signal, bearing the names of the Blossom and Herald, was erected on the top of Chamisso Island, and on the last day of September we left the Sound. We arrived off Petropaulowski on the 15th of October. There the winter had fairly set in: the ground was partly covered with snow; and a few seeds and mosses were all that could be collected. Five days we remained, and then steered away, accompanied by favourable breezes, for the burning sun of tropical America.

On the 14th of November, we found ourselves on the Californian coast, in sight of the Island of Guadelupe, whose northern part is clothed with Pines. The captain intended to send a boat ashore, but was deterred from doing so by the high surf. Without delay, we proceeded to Mazatlan, in Mexico. Its Flora does not materially differ from that of other places of the same coast; but as I was enabled, for five days, to visit the interior, I had a good opportunity of seeing a specimen of the mountain vegetation of Mexico.

I started, accompanied by Mr. Pakenham, a midshipman of the Herald, for San Sebastian, a town eighteen leagues inland, which, they told me, was elevated, and produced a great variety of plants. The lagoons and mangrove swamps that surround the port of Mazatlan, the abominable smell they diffuse, and the unhealthiness they spread over the adjacent country, rendered the first five leagues of our journey very unpleasant, but when we reached more solid ground, all was well. The *Tecomate* of the Mexicans (*Crescentia alata*, H. B. et K.), was here very plentiful. It is a tree about thirty feet high, whose fruit, resembling very much an unripe orange, contains a pulp of a sourish-bitter taste, which is boiled with sugar, and taken against complaints of the chest. All *Crescentiæ*, I am of opinion, are naturally littoral plants; for, although they are not so closely confined to the sea-coast as the *Avicennias* and *Rhizophoras*, yet they are, like many other maritime plants, the *Hibiscus arboreus*, *Cocus nucifera*, and *Pithecolobium macrostachyum*, for instance, capable of growing, under cultivation, far inland, but do not spontaneously extend their range beyond the limits of the sea-breeze.

San Sebastian we reached after one day's journey, but great was my disappointment in finding there the vegetation unchanged; its elevation hardly amounting to 1000 feet. Luckily the gentleman to whom I had a letter of introduction, took some interest in botany, (ever since Humboldt and Bonpland stayed at his house, as he expressed himself,) and told me that at one day's journey from San Sebastian, he had a farm surrounded by mountains, covered with Fir-trees, and several species of Oak. The inducement was so great, that I did not hesitate to go there, thinking that one day spent amongst the mountains would be better than three in the lowlands.

Next morning we started. Don Alejandro Bueso, our host, old as he was, accompanied us. We passed the villages of Nauches and Santa

Catarina, and after travelling eighteen leagues, the farm of our friend, La Hacienda de las Naranjas, presented itself. The finest flower we saw during the journey was your *Antigonon leptopus*. It covered nearly every bush, and the deep rose-coloured blossoms were so abundant that scarcely a leaf could be seen. *Cordia Gerascanthus*, *Quamoclit vulgaris*, *Ardisia coriacea*, and *Poinsettia pulcherrima*, were amongst many others we met with: the latter grows in dark localities on the banks of rivulets. *Hæmatoxylon Campechianum* (Logwood), here termed *Brasil*, is one of the most common trees of the whole district, and the cutting of it affords employment to a great number of people. Large quantities of the wood, especially that of the stems, which obtain double the price the branches do, are daily carried for sale to Mazatlan.

The following day we commenced ascending the *Cerro de Pinal*. Here, for the first time, a visible change in the vegetation took place. Having climbed 2000 feet, we fell in with the first Oak, of which genus three species were collected during the ascent: at 1000 feet higher the Firs commenced, and soon after constituted regular forests. The trees are from thirty to sixty feet high. I send leaves, flowers, and ripe cones, but I am unable to determine the species, as books are wanting; perhaps it is *Pinus radiata*, Don. Several fine plants were growing in that forest. The little *Pinguicula lilacina*, Schlecht., was extremely common. Next morning I put the plants into paper, and then departed with all despatch for Mazatlan, whence we were more than a hundred miles distant; but we arrived in good time.

We lifted anchor on the 4th of December, reached San Blas two days after, stayed there a few hours, and then directed our course towards Panama, where we arrived on the 19th of January, 1849, having been absent from that place eight months, and sailed, during that time, more than 23,000 miles.

DR. THOMAS THOMSON'S *Scientific Mission to* THIBET.

(*Continued from page* 81.)

Kashmir, Oct. 5th, 1848.

When I last wrote, on or about the 7th of August, it was my intention to have reported progress again on my return to Lé; but on reaching that place I found that very little benefit would result from

doing so, as a letter despatched from thence would have reached Kashmir only about a week earlier than myself. I have therefore delayed writing to you till my arrival here, so as to be able to give you an account of my journey to Lé.

You know already that my intention, in proceeding to the northward from Lé, was to visit the highest part of the mountain range lying between Ladakh and Yarkund. My road was therefore that followed by the merchants who trade between these two countries, who are the only travellers on this route, Yarkund being, you are aware, subject to the Chinese government, whose system of exclusion is there in full force. Early in spring and late in autumn the merchants, after crossing the mountain range to the north of Lé, follow the course of the Shayok river (the Chajouk of Baron Humboldt's letter), but a great part of the course of this stream is deep and rocky, so that from June to October, it cannot be forded; and hence, during these months, this route is impracticable, and another shorter but very mountainous road is used instead. I scarcely know how to explain this road without a map: it ascends what I have for convenience called the Nubra valley, namely that of a large tributary, which having been visited both by Moorcroft and Vigne, is laid down in the maps, and thence strikes across the mountains in a north-east direction till the Shayok is gained in the upper part of its course, above the unfordable part. If you have Vigne's map, you will find a fancy sketch of this route laid down in it; though it is made much further from Nubra to the Shayok than it really is. I left the plain of Nubra on the 10th of August, and arrived on the Shayok on the 13th. The road ascends nearly as high as 18,000 feet; the pass overhanging the Shayok is occupied by a mass of enormous glaciers. I estimated the bed of the Shayok to be elevated about 15,000 feet at the place where I reached it; and as the whole road through the mountains is above that height, I need not say that all cultivation was left behind in Nubra, and that the whole country was barren and desert. Formerly the road from this point continued to follow the course of the Shayok; but within the last ten years two immense glaciers have descended and crossed the stream, completely blocking up the valley. The first, which was nearly half a mile in width, I managed to cross; but the second was pronounced by men whom I sent to explore, perfectly impracticable, and as it quite shut up the view of the valley above, in all probability there were others in

all the ravines beyond. I shall not attempt to describe these grand rivers of ice, for it is impossible to do satisfactorily, and you having, I believe, seen many glaciers, can conceive what they must have been. The present road to Yarkund crosses the Shayok, and ascends a smaller branch which joins it. The lower part of this tributary stream is rocky and difficult, but after a few miles it becomes open, and for two days I marched, without interruption, along its gravelly bed, rising from below 16,000 to very near 17,000 feet. On the third day I left it, and making a short abrupt ascent up a ravine, emerged suddenly on a bare, stony plain,—a table-land of eight or ten miles in width, elevated from 17,500 to 18,000 feet above the level of the sea. When I had got fairly on this open plain, on looking back I perceived a continuous range of snowy mountains through which I had evidently passed during the two days that I followed the bed of the stream; and I at once recollected that on both these days all the ravines on my left hand, and some on my right, had been occupied by glaciers, which did not, however, descend very low. The range of snowy mountains extended as far as eye could reach on both sides, and, though I am a very bad hand at estimating height at a distance, I think I am within the truth in stating the peaks to have risen to at least 24,000 feet. My road lay nearly due north across the plain, at the end of which a gradual descent led to a small stream flowing from east to west through an open valley. This, I was informed, joined the Shayok, and along it ran the old road, now stopped by glaciers. From the open table-land, the only snowy range visible, was that to the south. The mountains to the north were not very elevated, and were only patched with snow. The plain itself was almost quite free of snow, and the two or three small patches which existed were evidently fast melting away. Crossing the stream, the bed of which was upwards of 17,000 feet in elevation, I found that the road took a northerly direction for about two miles, and then turned to the west up a wide valley, rising very gently. At the commencement of this I encamped, and leaving my tent, went on to visit the pass of the Karakoram, beyond which I did not intend to proceed. Following the valley for about eight miles, I then turned suddenly to the right or north, and a short steep ascent brought me to the top of the pass, which from the boiling point of water (by which only my heights are determined), I found to be 18,600 feet. It was quite free from snow, but on the slopes

above large patches lay in shady places, but no continuous snow-beds. To the north a small stream, commencing just below the pass, could be traced for about half a mile, at the end of which distance it disappeared among hills, by which the view is limited. Along this small stream I was informed the road to Yarkund runs, but through an absolutely desert country; so that I did not consider it advisable to proceed any further. I might, no doubt, have advanced several days' journey, but at the edge of the habitable country is a Chinese post, and as they had, probably, advice of my coming, they might have sent a party to meet and stop me; at all events, I should have been arrested at the edge of the interesting country, up to which point I could expect no novelty, either botanical or geographical. Returning by the way I came, I reached Nubra on the 2nd of September.

The natives of Ladakh and Nubra have no name for the extensive range of snowy mountains which run from E. S. E. to W. N. W., and their names are mostly confined to localities (towns or encamping places); even rivers have no general appellations. The name Karakoram is confined to the range north of the table-land, and in particular to the pass to which I ascended. This range, which probably nowhere exceeds 20,000 or 21,000 feet, seems an offset from the snowy range twenty or thirty miles further west. It is curious that, though much lower than the range further south, it is in fact the dividing range between the central or Yarkund basin and the basin of the Indus, several streams breaking through the snowy mountains to get to the Indus. Darwin, I recollect, observed a similar circumstance in the two parallel chains of the Andes. The table-land is, so far as I recollect, the most elevated plain in the world. It is highest to the west, but must there dip suddenly to the valley, or rather ravine, of the stream which I had ascended, which runs between it and the snowy range. To the east it sinks very gently, almost imperceptibly, and is bounded by low mountains five or six miles off. The average elevation of the plain is probably about 17,500 feet; and a low range of hills which occupy its north border before the descent to the Shayok, may attain a height of 18,000. Its surface is covered with small waterworn and angular fragments of all the surrounding rocks; and its substance seems to consist of a hardened calcareous clay, of which masses also occurred rolled on the surface. (The rock, where visible, is limestone.) Altogether, the general features at once suggested the idea of the bed

of a lake, and I have hardly any doubt that such is the explanation of this very curious tract of country.

I made many botanical acquisitions during this journey, principally in the earlier part, between Nubra and the Shayok. Here, from 14,500 feet, at which elevation the alpine region may be said to commence, to above 17,500, many beautiful alpine plants occurred in the crevices of the masses of stones (old moraines) which abound, and in damp places along the stream and the banks of rills. Unfortunately I was never free from the unpleasant head-ache which is caused by the rarity of the atmosphere, and was therefore less able to exert myself than I could have wished. The species were many of them new to me, but the forms almost entirely those of Europe and North Asia. Many *Cruciferæ*, especially *Draba*, *Astragali*, *Saxifrages* (including *S. cernua*), *Gentians*, *Lychnis*, *Cerastium*, *Thalictrum* (like *alpinum*),—the same Poppy as grows on the pass above Lé; numerous *Potentillæ* and a *Sibbaldia*, *Echinospermum*, *Delphinium*, &c., with several *Carices* and grasses. *Compositæ* were very abundant, and the most striking group were *Allardiæ*, a curious and pretty genus, of which I have at least four species. Many *Saussureæ*, too, occur all very small and dwarf; and lastly a nettle, was very abundant, and though a truly alpine species, it grew like its congeners, most rank and luxuriant near the usual halting-places of travellers. The top of the pass being occupied by a succession of glaciers, vegetation did not attain any unusually high limit. My camp at Sassar (by which name the place where I rejoined the Shayok is known to travellers,) was elevated about 15,500 feet, and might be 500 feet higher than the bed of the stream. At this height the vegetation was still alpine in character, but much more luxuriant than above. Here *Artemisiæ*, several *Astragaleæ*, *Heracleum*, *Cynoglossum* and *Echinospermum*, an *Allium*, a *Thermopsis*, now past flower, a beautiful deep blue *Nepeta*, *Dracocephalum heterophyllum*, *Marrubium*, *Eurotia*, and *Saussurea bracteata*, were common, with many others, on my first march from Sassar towards Karakoram. I encamped (at 15,300) at the only patch of real green turf which occurred on my journey to that place. It was swampy, with small stagnant pools, in which a curious broad foliaceous *Alga*, which seems to float without any attachment, is common. A few stunted bushes of *Myricaria elegans* occur around, and the turf, which consisted of four or five grasses and two *Carices*, was gay, with

a rather pretty *Primula*. Beyond, the whole country was extremely barren: the rocky or rather stony hill-sides produced a strongly aromatic *Saussurea*, a *Pyrethrum*, *Cicer Sonongaricum*, (?) and *Stipa*; but the most curious plant was a species of *Alsine*, or an allied plant, which formed extremely dense and hard tufts a foot or more in diameter. It began to appear at about 15,700 feet, and continued almost up to 18,000. I observed it, but without flowers, last year on several passes, and probably mentioned it in my letters. Above 16,000 feet very few plants occurred, and they were nearly all old acquaintances. Very dwarf *Saussureæ*, *Astragali* and *Cruciferæ*, two or three of each, a *Lychnis*, *Taraxacum*, two *Alsines*, and a stunted creeping *Myricaria*, which had so peculiar a habit that it must, I think, be specifically distinct, but it was past flower. On the table-land the only plant which occurred was the dense-tufted *Alsine* (*Thylacospermum*), large green patches of which were common. I except the bank of a small streamlet which produced a specimen or two of the common species, showing that want of water alone was the cause of their absence on the plain. The pass was also perfectly dry; a mass of stones without a vestige of vegetation, phenogamous or cryptogamous, nor did anything of the kind appear till at least 500 feet below and close to the bottom of the valley. Here a purple-flowered *Crucifera* rose highest. The whole number of flowering plants which rose above 17,000 feet was sixteen.

(*To be continued.*)

Death of GEORGE GARDNER, Esq.; Superintendant of the Botanical Garden, Ceylon.

Our readers, we are sure, will hear with deep regret of the recent and sudden death of Mr. Gardner, while on a visit to the Governor, at one of the seats of His Excellency. We cannot do better than relate this sad event in the words of his steady friend and patron, as contained in a letter to the Editor of this Journal, received April 18th.

"Neura Ellia Rest-house,
"Ceylon, March 11th, 1849.

"My dear Sir William,

"It is with very great pain and distress that I take up my pen to address you; but, knowing the interest and friendship you had for Dr. Gardner, and being unacquainted at this moment with his family

in Scotland, I relate to you my melancholy tale, trusting to your kindness to make it known to those it must so deeply interest. Poor Gardner arrived here yesterday at three o'clock, in high health and spirits, and was going on an excursion with me to the Horton plains. Never did he *seem* so well, and never more cheerful or agreeable; so much so, that when some of us went out to ride at four o'clock, we remarked it. He took some luncheon, and he said he should go to his room and rest after his journey.

"We had not ridden two miles when an express was sent to us to say he was taken severely ill. Dr. Fleming, (the ablest physician in the island,) was with me at the time, when we immediately returned and found him lying in a fit of apoplexy. Every possible means that science and skill could invent were employed, but nothing proved of any avail:—he breathed his last at eleven o'clock last night, in my presence, and I can truly say, surrounded by as many sorrowing hearts as if his own relations had been here. It appears from the account of the Rest-house keeper, that hearing him scream in his room, and exclaim, 'I am going to die!' he rushed in, when poor Gardner fell into his arms and said:—'Fleming; bleed!'—He must have been in the act of taking off his boots.

"We hear he had for the last two or three days been complaining of pain at the back of the head; and it is to be feared that he had been labouring too hard on the book which he was preparing for the press, and leading too sedentary a life. I remained with him from the moment I arrived, and you may assure his friends that every attention was paid to him. I can honestly say, that the colony and the public in general have experienced a severe loss in this talented and excellent man:—one who was loved by all. Never did I see so amiable a person; one who possessed more benevolence, or was more ready to impart information to those who asked for it. He is to be buried this evening, at six o'clock, and everybody will attend to pay the last mark of respect to our lost friend.

"I sent an express, last night, to the Agent at Kandy, to put a seal on all his papers and property. I know not if he has made a will, nor am I acquainted with the state of his affairs; but his botanical collections shall be carefully secured till I hear from you or some of his friends. One work, I know, is ready for the press, and was on the point of being sent home for printing. As the mail leaves almost at

this very hour, I am prevented from writing further; but I have requested Sir Emerson Tennent, who was his greatest friend, and may consequently know more of his affairs, to write to you also; and as he is at Colombo, in case the steamer is late, he may have an opportunity of sending you fuller information. Forgive a hasty scrawl: this sad affair has quite upset me.

"Your's very faithfully,
"TORRINGTON."

We have reason to believe that Mr. Gardner's library and botanical works, and his Herbarium, will be offered at a valuation to the Government, to form part of the establishment of Peradenia, an institution that, under his able directorship, has stood at the head of all colonial gardens. To much of his scientific labours the pages of this and other Journals have borne ample testimony, and his friends looked with confidence for greater works than these. The publication on which he was engaged was an Introduction to the study of Botany, especially calculated for India. Our own portfolio contains an elaborate manuscript paper on some new plants of China, discovered by Captain Champion, and he had collections and materials in a very forward state for a complete *Flora Zeylanica*. But he is cut off in the midst of his useful labours, to the regret of all who knew him.*

Durability of OAK TIMBER.

Two interesting specimens of Oak wood have been recently sent to the Museum of the Royal Botanic Gardens, showing under two different circumstances its great durability.

Capt. Sir Everard Home, Bart., R.N., presented to us a pile of Oak, taken up in the year 1827, from Old London Bridge, in the most perfect state of preservation. It had been thus immersed in the bed of the river for 650 years. The outside was rough and furrowed, but little corroded; and the inside was as sound as when the tree was first cut down, partly blackened or stained by the action of the water, but perfectly firm to the centre and capable of receiving a fine polish.

* Scarcely was the above notice penned, when we see by the Gardeners' Chronicle (April 21st) that Science has lost another distinguished botanist in the death of Professor ENDLICHER, at Vienna, author of a Genera Plantarum, and many other works of great learning and research.

Such is the state of Oak after lying under water for six centuries and a half.

Our second example is of Oak exposed to the vicissitudes of the atmosphere for a still greater number of years, and yet sound and hard, except from the attack of insects. The wood in question at one time constituted part of the walls of a church at Greenstead, Essex; which church has recently been condemned, in consequence of the serious inroads made in its otherwise perfect timbers by the *Ptinus*, a species of insect notorious for its rapid and destructive habits. This curious Church has been long known to antiquarians, being identified as the original shrine of St. Edmund, which was erected by the monks in the year 1010, the body of the canonized monarch resting at this place on its return from London to Bury, whence it had been removed for safety on an attack of the Danes. An account of its early history formed the subject of a paper by Mr. Burkitt, read at a recent meeting of the British Archæological Association, when records were quoted establishing its identity. Drawings and plans were exhibited, showing the form of the original shrine, which from time to time had been greatly altered to adapt it for a modern church. Its construction was extremely simple, and consisted of Oak trees split in two, and fastened together with wooden pins to a plate and sill. These split trees, placed upright and fitting close, formed the four walls. On the demolition of the church, the worm-eaten wood was removed; but a considerable portion, which was in an extraordinarily sound state, has been restored.

Such is the account recently published of the materials of this structure, which weathered the storms of nearly 840 years. Portions of the sound wood were lately presented to the Museum by Robert Bevan, Esq., of Bury St. Edmund's.

Toasted Grains *of India*.

Among the many curious objects lately presented to the Museum of the Royal Gardens of Kew, are the following, from our valued friend and correspondent J. R. Stocks, Esq., of Scinde, under the name of "*toasted grains*," and with the following notes.

"As nothing *done* with vegetables will be uninteresting to the Director of the Botanical Museum at Kew, I send, though a queer consignment, specimens of toasted grains as eaten by natives in Scinde, and indeed in India generally. They are very useful for journeys, and are prepared on hot sand in an iron vessel; some, as Jawar (*Sorghum vulgare*), and Muhaiee (*Zea Mays*), which swell and become light and white, are called Phulla, i.e., *swell-ies.* Some, as Chaur (Rice), are *also* called phulla; but these do not turn light and white. Wheat and Gram are merely burnt and toasted, and not changed in look.

"Gram (*Cicer arietinum*,* lentils), is further rolled in powdered sugar-candy, and becomes a kind of comfit.

"Gram-flour is made up with sesamum-oil into a mass, which rolled in sugar-candy forms a kind of sweetmeat."

Chinese Grass-Cloth,

It is very pleasant to receive assurances of the satisfaction with which our remarks on the *vegetable products* of *plants* in this Journal have been received by the subscribers, especially of such as are exhibited in the already extensive Museum of the Royal Gardens. Much of the value of these observations depends on the accuracy of the statements respecting the origin of these products, that is, the *correct* name and history of *the plant* yielding these useful substances; and our readers are perhaps not aware of the excessive difficulty of getting access to authentic sources on these points. An extensive museum, where comparisons may be made, a rich botanic garden, a great Herbarium, a large and costly library, a correspondence held with individuals in various parts of the world, are all necessary for obtaining the requisite information:—and with all this, we have only to look at any Materia Medica, to any Dictionary of Arts and Commerce, or to any work professedly treating on such subjects, to be aware of the ignorance which exists on some of our most useful drugs, dye-stuffs, and of many other articles of commerce. The following is an extract from the Botanische

* "They have it that Pythagoras forbade beans to his disciples for cleanly reasons. The Scindes have a saying which reminds me of this idea:—

Chumna (*Cicer arietinum*) tit-a-guhna
Muttur (*Lathyrus sativus*)-a-math ma hun.

i.e., Dat crepitus multos *Cicer*, at *Lathyrus* strepit usque."

Zeitung, for the 12th January, 1849, under the head of "Learned Societies."

"At the meeting of the Society of Naturforschende Freunde, at Berlin, on the 21st of November, Dr. Münter made some observations on his researches in regard to a plant of *Corchorus capsularis.* The *liber* serves for the manufacture of Chinese articles known by the name of Grass-cloth. The bark-cells descend regularly in thin bundles down to the top of the root, while those of the flax terminate below the insertion of the cotyledons, singly, and producing tumefactions. We add that, according to the account given by Mr. C. Bouché, garden-director to the Berlin Garden Association, seeds received under the name of Yellow Grass-cloth yielded a sort of *Cannabis;* while those of White Grass-cloth produced *Corchorus capsularis.*"

With reference to the above article we beg to remark that none of the species of *Corchorus* yield anything like the beautiful fabric called Grass-cloth, of China, which is undoubtedly the produce of an *Urtica* (or *Boehmeria*) *nivea*, Willd. The several varieties of the fibre, called in Bengal *Pat* and *Jute*, are produced by *C. capsularis* and others: they are most extensively used for making bags for holding sugar and rice, and the like; and the article has been lately introduced into England to the amount of £300,000 per annum, as stated at page 25 of the present volume.

We shall offer a figure of this plant, which we have raised in the Botanic Garden, ere long.

NOTICES OF BOOKS.

ICONES CARPOLOGICÆ, *or Figures and Descriptions of* FRUITS *and* SEEDS; *by* THOMAS SHEARMAN RALPH, A.L.S. London, Pamplin, 1849. 4to. 40 plates.

"Since the time of Gärtner," says Mr. Ralph in his Introduction, "whose memory will last as long as Carpology shall be studied, no work illustrative of fruits and seeds having appeared (except some papers of Correa de Serra in the Annales du Muséum, vols. 8, 9, 10 and 18), and the vast number of genera and species of plants discovered since his time, having opened a very extensive field for observation and study, the author has been induced to follow in the footsteps of this great master, by bringing out the *Icones Carpologicæ*, in the hope that this branch

of natural history will make advances commensurate with our extended knowledge of plants. Our present number will be found to contain about four hundred illustrations, embracing two hundred genera of the *Leguminosæ*, being only half the number of the Order, as enumerated in *Endlicher's Genera Plantarum*:—a circumstance partly due to the entire absence either of the fruit, or of any figures of the same in works, to which latter recourse has been had when the former has failed; and to this circumstance, also, any want of extended dissections of the fruit and seed is to be attributed; and in most instances the authority for the figure thus quoted has been given."

Such are Mr. Ralph's motives for undertaking the work, and such, in few words, the nature of the work. The author has performed what he promised, and a very useful volume is here offered to the student of Carpology, which we trust will meet with encouragement from the public. As many of the figures are professedly copied from other publications, their correctness or otherwise depends much on the fidelity of the original plates. We could have wished, unless the author were prepared with such a mass of materials at his command as to warrant him in publishing in consecutive numbers, a general work on Carpology, that it had been made a *Supplement* to the admirable work of Gaertner, omitting assuredly all copies from Gaertner's figures, unless with a view of improving upon them or correcting them, which we cannot find, is the case. Indeed, neither the execution, nor the amount of analysis, especially of the parts of the seed, is on a par with botanical engravings of the present day; but often *scratchy*, and imperfectly printed. The industry of the author will be the remedy for this in his continued practice; since both the drawings and the lithographs are executed by himself.

Botanical Society, April 13th, 1849.

J. E. Gray, Esq., F.R.S., President in the Chair. Dr. Mitchell, of Nottingham, and F. Dickinson, Esq., of London, were elected members.

Mr. H. Taylor exhibited specimens of *Anemone ranunculoides*, L., from the old station at Abbots Langley, Herts.

Mr. George Maw presented a specimen of *Linaria supina*, Desf., discovered by him at St. Blazey's Bay, Cornwall, in March last. The continuation of Mr. Woodward's paper on the Flora of Gloucestershire was read.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

Continued from p. 136.

Calcutta to Darjeeling in Sikkim-Himalaya.

March 7.—Left my kind friend Mr. Felle's house for Amoee, *en route* for Mirzapore, myself mounted on an elephant of the Rajah's, and my goods on Mr. Felle's camels. Passed through Goorawul, a large village twelve miles due west of Shahgung. The road to it lay over a very flat monotonous country. Thence turning north, in a direction crossing the table-land, the country began to undulate and become more barren, with noble Mahoua trees and a few *Fici*, the former resembling oaks; and with the sandstone cropping out on the surface. I was occasionally much reminded of scenery in the forest of Dean. Sterile tracts, with their typical trees, alternate with cultivated fields, whose accompaniments are the Tamarind and Mango.

Many of the exposed slabs of sandstone are beautifully waved with the *ripple-mark*, like small specimens seen at Rotas.

Amoee, where I arrived at nine P.M., was an open grassy flat, about twenty miles from the Ganges, along whose course the dust clouds were coursing.

Mr. Monney, the magistrate of Mirzapore, kindly sent a mounted messenger to meet me here, the finest-looking fellow I had seen for a long time, wearing a brilliant scarlet surtout and white turban. He was a very active fellow, equally proud of his master (with good reason) and his horse; but he had vast trouble in getting bearers for my Palkee, which, after being carted for so long, was now to take its turn in carting me. Those he did procure (eight) carried me (for the greater part of the way) and the Palkee the whole twenty-two miles in eight hours, over very bad and stony paths, and down the ghaut, which is, however, an excellent road.

To the top of the ghaut the country was nearly level (and here called the Bind hills). There I saw for the first time the Ganges, rolling along the plains, through a forest of green trees, among which the white houses, domes, and temples of Mirzapore were scattered in every direction.

Unlike the Dunwah pass, this, to the level of the Ganges, is wholly barren. At the foot the sun was intensely hot, the roads rocky or smothered with dust by turns, the villages crowded with a widely different looking race from those of the hills, and the whole air of the outskirts, in a sultry afternoon, far from agreeable.

Mirzapore is, however, an exceedingly pretty, a moderately cool, and very pleasant station, especially the *geographically* east, but socially speaking west-end, which runs along the banks of the Ganges, and whither I proceeded to the house of my friend Mr. Claude Hamilton, where I received a most cordial welcome.

Mirzapore is celebrated for its manufactory of carpets (of a kind like our dining-room one), which are admirable looking, and in all respects save durability I am told are equal to the English. Indigo seed from Bundelkund is also a most extensive article of commerce, the best coming from the Doab, and lac. For cotton, sugar, and saltpetre, it is the greatest mart in India. Bundelkund indigo seed is good and larger but not equal to the Doab. The articles of native manufacture are brass washing and cooking utensils, and stone deities worked out of the sandstone.

There is little native vegetation, the country being covered with cultivation and extensive groves of Mango, and occasionally of Guava. English vegetables are abundant and excellent, and the strawberries rival in size the European fruit, but hardly in flavour.

The atmosphere is extremely dry and electrical, the hair constantly crackling when combed. Further west, where the country is still drier, the electricity of the air is even greater. Griffiths mentions that in filling his barometer tubes in Affghanistan, he constantly experienced a shock.

Here I had the pleasure of meeting Lieut. Ward, one of the assistant suppressors of Thugge (Thuggee, in Hindostan, signifying a deceiver, fraud, not open force being employed). This gentleman kindly showed me the approvers or king's evidence, of his establishment, belonging to those three classes of human scourges, the Thug, Dakoit, and Poisoner. Of these the first was the Thug, a mild-looking man, who was born and bred to the profession: he has committed many murders, sees no harm in them, and feels neither shame nor remorse. His organs of observation and destructiveness were large, and the cerebellum small. He explained to me how the gang waylay the unwary traveller,

enter into conversation with him, and have him suddenly seized, when the superior whips off his own linen girdle, throws it round the victim's neck and strangles him, pressing the knuckles against the spine. Taking off his own cummerbund, he passed it round my arm (not neck) and showed me the turn as coolly as a sailor once taught me the *hangman's knot*. The Thug is of any caste, and belongs to any part of India. The profession have particular stations, where they generally murder, throwing the body into a well. The Dakoit (dakhee, a robber) is one of a class who rob in gangs, but never commit murder,—arson and housebreaking are also their profession. These are all high-class Rajpoots, originally from Guzerat, who, on being conquered, vowed vengeance on mankind. They talk both Hindostanee and the otherwise extinct Guzerat language. This latter the Dakoit spoke to me: it was guttural in the extreme, and very singular in sound. These are a very remarkable people, found all over India, and called by various names, as Buddacks (butchers), Sear Marwa, or Shighal Khor (jackall-eaters in pure Persian, *i.e.*, a barbarian with no prejudice against the unclean). The women dress peculiarly, and are utterly devoid of modesty. The *specimen* I examined was a short, square, but far from powerful Nepalese, with high arched eye-brows, and no organs of observation. These people are great cowards. The poisoners all belong to one caste of Pasie, or dealers in toddy: they go singly or in gangs, haunting the travellers' resting places, where they drop half a rupee weight of pounded or whole *Datura* seeds into his food, producing a twenty-four hours' intoxication, during which he is robbed, and left to recover or sink under the stupifying effects of the narcotic. He told me that the *Datura* seed is gathered at any time, place, or age of the plant. He was a dirty, ill-conditioned looking fellow, with no bumps behind his ears, or prominence of eyebrow region, but an *undeniable* cerebellum.

As you may care to hear more of these celebrated Thugs, I will give you what information I picked up. (All this and better, too, you will find in Sleeman's Reports). Though now all but extinct (except in Cuttack), through ten or fifteen years of increasing vigilance on the part of our Government, and incredible activity and acuteness on the officers employed, they were till then a wonderfully numerous body, who abstained from their vocation solely in the immediate neighbourhood of their own villages. These villages, however, were not exempt

from the visits of other Thugs; so that, as Major Sleeman says,—"The annually returning tide of murder swept unsparingly over the whole face of India, from the Sutledge to the sea-coast, and from the Himalaya to Cape Comorin. One narrow district alone was free, the Concan, beyond the ghauts, whither they never penetrated." In Bengal, river Thugs, of whom I shall tell you hereafter, replace the travelling practitioner. Khandush and Rohilcund alone harboured no Thugs as residents, but they were nevertheless haunted by the gangs.

Their origin is uncertain, but supposed to be very early, soon after the Mahommedan conquest. They now claim a divine original, and are supposed to have supernatural powers, and to be the emissaries of the divinity, like the wolf, the tiger, and the bear. It is only lately that they have swarmed so prodigiously,—seven original gangs having migrated from Delhi to the Gangetic provinces about 200 years ago, and from these all the rest have sprung. Many belong to the most *amiable, intelligent, and respectable classes* of the lower and even middle ranks: they love their profession, regard murder as sport, and are never haunted with dreams, or troubled with pangs of conscience during hours of solitude, or in the last moments of life. The victim is an acceptable sacrifice to the Goddess Davee, who by some classes is supposed to eat the lifeless body, and thus save her votaries the necessity of concealing it.

They are extremely superstitious, always consulting omens, such as the direction in which a hare or jackall crosses the road; and even far more trivial circumstances will determine the fate of a dozen of people, and perhaps an immense treasure. All worship the pick-axe, which is symbolical of their profession, and an oath sworn on it binds closer than on the Koran. The consecration of this weapon is a most elaborate ceremony, and takes place only under certain trees. They rise through various grades to the highest of strangler; the lowest are scouts; second, sextons; the third are holders of the victims' hands.

Though all agree in never practising cruelty, or robbing previous to murder,—never allowing any but infants to escape, and these are trained to Thuggee,—and never leaving a trace of such goods as may be identified,—there are several variations in their mode of conducting operations. Some tribes spare certain castes, others none: murder of woman is against all rules; but the practice crept into certain gangs, and this it is which led to their discountenance by the Goddess Davee, and

the consequent downfall of the system. Davee, they say, allowed the British to punish them, because a certain gang had murdered the mothers to obtain their daughters to be sold to prostitution.

Major Sleeman has constructed a map demonstrating the number of "Bails," or regular stations for committing murder, in the kingdom of Oude alone, which is 170 miles long by 100 broad, wherein are 274, which are regarded by the Thuggee with as much satisfaction and interest as a game-preserve is in England. Nor are these Bails less numerous in other parts of India. Of twenty assassins who were examined, one frankly confessed to having been engaged in 931 murders, and the least guilty of the twenty, to 24. Sometimes 150 persons collected into one gang, and their success has often been immense, the murder of six persons on one occasion yielding 82,000 rupees.

Of the various facilities for keeping up the system, the most prominent are the practice amongst the natives of travelling before dawn, of the travellers mixing freely together, and taking their meals by the wayside instead of in villages,—in the very Bails, in short, to which they are inveigled by the Thug in the shape of a fellow-traveller: money-remittances are also usually made by disguised travellers, whose treasure is exposed at the custom-houses; and, worst of all, the bankers themselves will never own to the losses they sustain, which, as a visitation of God, would, if avenged, lead, as they think, to future and perhaps heavier punishment.

Had the Thugs ever destroyed Englishmen, they would quickly have been put down; but practised, as the system was, invariably on a class of people acknowledging the finger of the Deity in its execution, its glaring enormities were long in rousing the attention of the Indian Government.

A few examples of the activity exercised by the suppressors will interest you. They act wholly through the information given by approvers, who are simply king's evidences. Of 600 Thugs engaged in the murder of 64 people, and plunder of 191,000 rupees, all except seventy were captured in ten years, though separated into six gangs, and their operations continued from 1826 to 1830: the last party was taken in 1836. And again, between the years 1826 and 1835, 1562 Thugs were seized, of whom 382 were hanged, and 909 transported; so that now it is but seldom these wretches are ever heard of.

Of the extent to which their operations were carried I can give no better idea than by quoting two anecdotes in Sleeman's Reports. He states that he was for three years in charge of a village on the Nerbudda, and considered himself "*au fait*" at every circumstance that occurred in the neighbourhood; yet, during that time, 100 people were murdered and buried within 400 yards (less than a quarter of a mile) of his own residence! Again, he says, he was encamped in a Mango-tope, which proved to have been a Bail, and where, on the following day, seventeen bodies were exhumed. His wife's bed stood above the grave of five, his horses were picketted over five more, and the tent-ropes spanned seven others. Though perfectly unconscious of this circumstance, Mrs. Sleeman's rest was disturbed by horrid dreams, such as she had never previously experienced: "Her soul had consciousness," &c., &c. See "Report."

Two hundred and fifty boats full of River Thugs, in crews of fifteen, infested the Ganges between Benares and Calcutta, during five months of every year, under the pretence of conveying pilgrims. Travellers along the banks were tracked, and offered a passage, which if refused in the first boat was probably accepted from some other. At a given signal the crews rush in, double up the poor decoyed victim, break his back, and throw him into the river, where floating corpses are, as you know, too numerous to elicit even an exclamation.

So much for Thuggee. Often as I had heard of it (and read a little), I was so interested in Lieut. Ward's narratives, and so impressed with the vigour and success of the persons and means employed in the suppression of this devilish system, that I collected all the above leading facts connected with its rise and progress.

Mirzapore is a straggling town, with upwards of 100,000 inhabitants—quite a small place for India. Large squares and broad streets are interspersed with acres upon acres of low huts and groves of trees. The vicinity of the Ganges and its green banks, and the great numbers of fine trees around Mirzapore, render it a pleasing but not a fine town. It is built on a dead level flat; and the channel of the river, being fifty feet lower, keeps almost out of sight the few boats that ply upon it. The country round consists of fields of barley and wheat, and the town itself has the usual Asiatic mixture of squalor and gaudiness. You come occasionally upon an ornamented house, of good style and excellent workmanship, standing forth in strong contrast with all that

is odious. That a degree of taste still lingers in these oriental cities is evident from a beautifully carved stone well, situated in a public square: its arches and arabesque-work reminded me of the Alhambra. The square itself was till lately a pestilential tank, filled up by Mr. Monney, the magistrate. He bought the ground, and planned the buildings to be erected thereon; and the allotments were all quickly purchased by native merchants.

At Mirzapore I engaged a native boat to carry me down the river to Bhaugulpore, from whence I was to proceed to the Sikkim-Himalaya. The accompanying sketch will give you some idea of this "charming yacht," which, though slow and very common, had the advantage of being cooler and more commodious than the handsomer craft. I have said little of Mirzapore, because there is nothing deserving particular notice.

March 15.—Left Buttowly ghauts, whither my boat had been sent from Mirzapore, and in the afternoon passed Chunar. Chunar is the first station in which Henry Martyn laboured after his arrival in India. This is a noble tabular mass of sandstone, projecting into the river, and interesting to me, as the last trace of the Kymaor or Vindhya range. There is not another rock between it and the Himalaya, nor even a stone, all the way down the Ganges, till you again meet the granite and gneiss rocks of the Behar range. Chunar and Rotas were both captured by Sir Home Popham. The current of the Ganges is very strong here, and the breadth is considerably less. The river runs between high alluvial banks, in which is much kunker deposit. The boatmen pull very languidly, but the current helps us on; they anchor close to shore every night, eat their evening meal, wrap themselves in their kupra (garments), and lie down to sleep in the open sky.

March 16th.—We arrived at Benares. The Ganges is here a broad stream, and rises 43 feet during the rains, with a current of eight miles an hour, and, I am informed, carries along one-quarter per cent. of sediment. The fall from hence is 300 feet to the junction of the Ganges and Hooghly, which is one foot to every hundred miles. My observations make the fall from Mirzapore to Benares very much greater.

Benares is the Athens of India. The variety of buildings along the bank is incredible. There are temples of all shapes, in all stages of completeness, and at all angles of inclination; for the banks give way so much that many of these edifices are fearfully out of the per-

pendicular. It is a most quaint river-frontage; and perhaps, to a long resident in India, it may look magnificent; but I was much disappointed. As an eastern city it is incomparably inferior to Cairo. The *massive* alone survives to become venerable in India; and a city placed on a flat requires more lofty buildings than Benares can show, with wider streets; also that more prominence and space be given to what is good than its dense population, estimated at 600,000, can allow. The once magnificent palace, now fast crumbling to ruin, is dirty, wholly neglected, and so elbowed by lofty houses, that its interior alone can be viewed to advantage. Here the remains of exquisite tracery of lattice-work and mosaic, claim high admiration; but they are disposed in long galleries, open to the dusty, sultry air, and command no other prospect than the roofs of innumerable houses, and a far from picturesque river. It may be from want of taste, or of judgment, or both; but I could not get the view of the Thames and the tiles, as seen from the Blackwall railway, out of my head,—a region, too, of which one hears a little less than of Benares. The famed mosque, the Midardos Minar, built by Aurungzebe on the site of a Hindu temple, is remarkable for its two octagonal minarets, 232 feet above the Ganges. The view, especially of the European Resident's quarter, over the town, is fine; but the building itself is deficient in beauty or ornament: it of course commands the muddy river with its thousands of boats, its waters peopled with swimmers and bathers, who spring in from the many temples, water-terraces, and ghauts on the city-side: the opposite is a great sandy plain. The town (of 600,000 inhabitants) below, looks a mass of poor, square, flat-roofed houses, of which 12,000 are brick, and 16,000 mud and thatch, through the crowd of which, and of small temples, the eye wanders in vain for some attractive feature or evidence of the wealth, the devotion, the science, or the grandeur of a city celebrated throughout the East for all these attributes. Green parrots and pigeons are certainly prettier than crows and sparrows; and in this respect alone did Benares excel the many views I have had of objects in nature and objects of art. The general appearance of an oriental town is always more or less ruinous; and here there was nothing to be seen of architecture but crumbling house-tops beyond the banks of the river. The eye is fatigued with pigeons, parrots, pots, plaster, pan-tiles,—the ear with prayer-bells and Poojahs; whilst the *Peepul* and *Parkinsonia* are the only green things to be

seen on this side of the bright meadows and green trees which adorn the European residents' dwellings, some four miles back from the river. The streets are so narrow, that it is difficult to *ride a horse* through them; and the houses are often six stories high, with galleries crossing above, from house to house. These tall, gaunt edifices sometimes give place to clumps of cottages, and a mass of dusty ruins, the unsavoury retreats of vermin and filth, where the *Calotropis arborea* generally spreads its white branches and hollow glaucous leaves—a dusty plant. Here, too, enormous spiders' webs hang from the crumbling walls, choked also with dust, and resembling webs of coarse muslin, being often some yards across, and not arranged in radii and arcs, but spun like weavers' woofs. Paintings, remarkable only for their hideous proportions or want of perspective, are gaudily daubed in scarlet, ochre, and indigo. The elephant, camel, and porpoise of the Ganges, dog, shepherd, peacock, and horse, are especially frequent, and so is a running pattern of a hand spread open, with a blood-red spot on the palm. A less elegant, but more frequent object, is the fuel, which is collected on the roads of the city, moulded into flat cakes, and stuck on the walls to dry, retaining the sign-manual of the artist in the impressed form of *her* always outspread hand. The cognizance of the Rajah, two fish chained together, frequently appears, especially over the gates of public buildings.

The hundreds of temples and shrines throughout the city are its most remarkable feature: sacred bulls and lingams of all sizes, strewed with flowers and grains of rice, meet the eye at every turn; and the city's boast is the possession of one million idols, which, of one kind and another, I can well believe. The great Hindoo festival of the *Holi* was now celebrating, and the city more than ordinarily crowded; though I regretted the stoppage of business, and especially the shutting up of the far-famed jewellers' shops. Throwing red powder (lac and flour), with rose-water, is the great diversion at *Holi*-time, more childish by far than a carnival.

Through the kindness of my host, E. A. Reade, Esq. (the Commissioner), I obtained admission to the Bishishar-Kumardil, the "holiest of holies." It was a small, low, stone building, daubed with red inside, and swarming with stone images of Brahminee bulls and lingams, and various disgusting emblems. A fat old Brahmin, naked to the waist, took me in, but allowed of no followers; and what with my ignorance

of his phraseology and the clang of bells and din of voices at prayer, I gained little information. Some fine bells from Nepaul were evidently the wonder of the temple. I emerged, adorned with a huge chaplet of Champaca flowers, and my hands full of *Calotropis* and *Nyctanthus* blossoms, smelling very strong of a worshipper, and looking like a fool. It was a horrid place for noise, smell, and sights,—*Devilish*, in every sense of the word.

At this early hour, 6 A.M., the streets were crowded with worshippers going to the temples.

From hence I went to the Gyam Bafe Musjud, a holy well, rendered the more sacred because Siva, when stepping from the Himalaya to Ceylon, accidentally let fall a medicine-chest into it. Natives frequent it with little basins or baskets of rice, sugar, &c. dropping a little in of each as they mutter their prayers,—offerings which tend to increase the medicinal effect of the waters, which resides in their atrocious stench and putridity.

The Observatory of Benares, and those of Dehli, Matra on the Jumna, and Oujein, were built by Jey-sing,* Rajah of Jayanagar, upwards of 200 years ago: his skill in mathematical science was so well known, that the Emperor Mahommed Shah employed him to reform the calendar. Mr. Hunter, in the *Asiatic Researches*, gives a translation of the lucubrations of this really enlightened man, as contained in the introduction to his own Almanac. It thus begins:

" Praise be to God, that the minutely discerning genius of the most profound geometer, when uttering the smallest particle of truth, may open the mouth in confession of inability; and so worthy of adoration, that the study and accuracy of astronomers, who measure the heavens, on the first step towards expressing it, may acknowledge their astonishment and utter insufficiency. Let us devote ourselves at the altar of the King of kings—hallowed be His name!—in the book of the register of whose power the lofty orbs are only a few scattered leaves, and the stars, and that heavenly courser, the sun, but as a small piece of money in the treasury of the empire of the Most High.

" If He had not adorned the pages of the table of the climates of our earth with the lines of rivers, and the character of grasses and trees, no calculator could have constructed the almanac of the various seeds

* Founder of Benares Observatory.

and fruits it contains; and if He had not enlightened the dark path of the elements with the torches of the fixed stars, the planets, and the resplendent sun and moon, how could it have been possible to have arrived at the end of our wishes, or to escape from the labyrinth and the precipices of ignorance?

"From inability to comprehend the all-pervading beneficence of this power, Hipparchus is an ignorant clown, who wrings the hands of vexation; and in the contemplation of this exalted majesty, Ptolemy is a bat, who can never arrive at the sun of truth," &c.

All this is very sage, but his earthly king must come in for a share of flattery, more fulsome and less neatly worded than the above, but still so good a specimen of oriental hyperbole, that I shall give it. Having found that the old tables did not tally with the astronomical observations, whether European, Asiatic, or Hindu, Jey-sing proceeded to inform the Emperor of the fact, and thus prefaced his request:—

"Seeing that very important affairs of religion and administration depend on these (tables), and that in the rising and setting of the planets and seasons of eclipses of the sun and moon, much disagreement was found to exist, he (the author) represents it to His Majesty of dignity and power, the sun of the firmament of felicity and dominion, the splendour of the forehead of imperial magnificence, the unrivalled pearl of the sea of sovereignty, the incomparably brightest star of the firmament and of empire, whose standard is the sun, whose retinue the moon, whose lance is Mars, and his pen like Mercury, with attendants like Venus, whose threshold is the sky, whose signet is Jupiter, whose sentinel is Saturn; the Emperor descended from a long race of kings, an Alexander in dignity, the shadow of God, the victorious king—Mahommed Shah—may he be ever triumphant in battle," &c.

The Emperor's commands being thus sought and obtained, it behoved Jey-Sing to set about his work, which demanded the building of observatories—a mighty task, contemplated by no previous Rajah, since the time of the Martyr-prince, Mirza Uleya Beg ("whose sins are forgiven"), and to the prosecution of which he "bound the girdle of resolution round the loins of his soul," and constructed instruments of his own invention, of perfect stability of stem and limb, including a Semrat-yunta, the "semi-diameter of which was eighteen cubits, and one minute on it a barley-corn and a half." In short, he completed

observatories, and filled them with instruments, whose "exactness was all that the heart of man could desire."

The more important instruments which I saw you will find sketched, they are the Semrat-yunta, or Equatorial dial; Naree-wila, or Equinoctial dial; and an anonymous equatorial, probably a Kranti-urit, or circle of declination. Jey-Sing's genius and love of science seem, according to Hunter, to have descended to some of his family, who died early in this century, when "Urania fled before the brazen-fronted Mars, and the best of the observatories, that of Oujein, was turned into an arsenal and cannon foundry."

To myself, the Observatory was the most interesting object in Benares, though it is now a dirty, ruined building, and the great stone instruments are rapidly crumbling away. The building is square, with a central court and flat roof, round which the astrolabes, &c. are arranged. A naked Astronomer-Royal, with a large sore on his stomach, took me round—he was a pitiful object—and told me he was very hungry, pinching himself in at the same time, with the air of the starved Apothecary. Truly, I thought, astronomers were well maintained in India, at a period when apothecaries starved at home! but the tables are turned now. The Observatory is nominally supported by the Rajah of Jeypore, who assuredly doles out a too scanty pittance to his scientific corps. After all, the Observatory was as good for Benares, if not better, than the Glasgow one used to be immediately previous to my active master Professor Nicol's time.

In the afternoon, Mr. Reade drove me to the Sar-Nath, a singular Boodhist temple, a cylindrical mass of brick-work, faced with stone and surmounted by a tall dome, altogether about seventy or a hundred feet high. The Boodh idols were originally in niches, all round the cylindrical portion; only one remains, the others having been used by a recent magistrate of Benares in mending a bridge over the Goomty! The scrolls, on the stone facing, were very beautiful, and as sharp as if freshly cut; from hence the Boodhist monuments, Hindu temple, Mussulman mosque, and English church, were all embraced by one *coup d'œil*. On our return, we drove past many enormous mounds of earth and brick-work, the vestiges of Old Benares, but whether once continuous with the present city or not is unknown. Remains are abundant, eighteen feet below the site of the present city.

Benares is the Mecca of the Hindoos, and the number of pilgrims

who visit it is incalculable. One man has paid it sixteen visits from the Straits of Ceylon, which, considering the absence of railroads, is sufficiently remarkable. Casi (its ancient name, signifying splendid,) is alleged to be no part of this world, which rests on eternity—whereas Benares is perched on a prong of Siva's trident, and is hence beyond the reach of earthquakes. Once built of gold, the sins of the people were punished by its transformation into stone, and latterly into mud and thatch; whoever enters it, and especially visits its principal idol (which is Siva fossilized), is secure of heaven; and even the beef-eating English may thus effect a future absorption into the essence of Siva.

March 18.—Left Benares for Ghazepore, where I spent a delightful day with Mr. and Mrs. Trench; the former is the poet's brother, and an excellent artist. It is a pretty town, situated on the north bank of the river, celebrated for its manufacture of rose-water, for the tomb of Lord Cornwallis, and the site of the Company's stud. The Rose-gardens surround the town: they are fields, with low bushes of the plant grown in rows, red with blossom in the morning, but all plucked long before mid-day. The petals are put into clay-stills, with twice their weight of water, and the produce exposed to the fresh air, for a night, in open vessels. The unskimmed water affords the best, and it is often twice and even repeatedly distilled; but the fluid of course deteriorates by too much distillation. The Attar is skimmed off the exposed pans, and it sells at £10 the rupee weight, to make which 20,000 flowers are required. It is frequently adulterated with Sandal-wood oil.

Lord Cornwallis's mausoleum is a handsome building, modelled by Flaxman after the Sybil's Temple. The allegorical designs of Hindoos and sorrowing soldiers with reversed arms, which decorate (*potius* desecrate) two sides of the enclosed tomb, though perhaps as good as can be, are under any treatment unclassical and uncouth. The simple laurel and oaken chaplets on the alternating faces are far more suitable and full of meaning.

March 21.—Left Ghazepore and dropped down the Ganges. The general features of the river are soon described. A strong current four or five miles broad, of muddy water, flows between a precipitous bank of alluvium or sand on one side, and a flat shelving one of sand or more rarely mud, on the other. Sand-banks are frequent in the river, especially where the great affluents débouche; and thence generally arise

the vast characteristic expanses of sand, small "Saharas," studded with the Simooms, stalking pillars of sand seventy or eighty feet high, erect, stately, grave-looking columns, all shaft, with neither basement nor capital, doubtless the genii of the "Arabian Nights." The river is always dotted with boats of all shapes, mine being perhaps the most common kind; the great square, Yankee-like steamers, towing their accommodation-boats (as the passengers' floating hotel is called), are the rarest. Trees are few on the banks, except near villages, and there is not a Palm to be seen above Patna. Towns are unfrequent, such as there are being mere collections of huts, with the ghaut and boats at the bottom of the bank; and at a respectful distance from the bazaar, stand the neat bungalows of the European residents, with their smiling gardens, hedgings and fencings, and loitering servants at the door. A rotting charpoy or bedstead on the banks is a common sight,—the "*sola reliquia*" of some poor Hindu, who departs this life on the banks, and thence is committed to the stream.

A few insects skim the surface, and shoals of small goggled-eyed fish are seen that spring clear out of the water, and are preyed upon by terns and other birds, turtle, and the porpoise puffing and tumbling along, all forming a very busy contrast to the lazy alligator, sunning his green and scaly back near the bank, with his Icthyosaurian snout raised high above the water. Birds are numerous, especially early and late in the day. Along the silent shore the hungry Pariah dog may be seen tearing his meal from some stranded corpse, whilst the adjutant-bird, with his head sunk on his body and one leg tucked up, patiently awaits his turn. At night the beautiful Brahminy geese alight, one by one, and seek total solitude; ever since having disturbed a god in his slumbers, these birds are fated to pass the night in single blessedness. The gulls and terns, again, roost in flocks, as do the wild geese and pelicans,—the latter, however, not till after making a hearty and very noisy supper. These birds congregate by the sides of pools, and beat the water with violence, so as to scare the fish, which thus become an easy prey. This fact was, I believe, first indicated by Pallas, during his residence on the banks of the Caspian Sea. Mr. Hodgson again observed it and communicated it to me.

Shells are scarce, and consist of a few small bivalves, their comparative absence is probably due to the paucity of limestone in the mountains, whence the many feeders flow. The sand is pure white and

small-grained, with fragments of hornblende and mica, the latter varying in abundance as a feeder is near or far away. Sand of rose quartz is very common, and deposited in layers with the white, which would constitute ribbon-jasper, if duly acted upon by certain agents.* Worm-marks, ripple-marks, and the footsteps of alligators, birds, and beasts in the wet sand remind one of the fossil footsteps in the Lancashire sandstones.

Not a rock, stone, or pebble occurs anywhere between Chunar and the rocks at Monghyr; and the vegetation of the banks consists consequently of annuals which find no permanent resting-place. Along the sandy banks the ever-present plants are *Ranunculus sceleratus*, *Rumex Wallichianus*, *Gnaphalium luteo-album*, a *Potentilla*, and very frequently *Veronica Anagallis*. On the alluvium grow the same, mixed with *Tamarix*, *Acacia Arabica*, and a few other bushes.

Notes on new or little known PLANTS OF CHINA; *by* H. F. HANCE, *Esq.*

SYNAEDRYS. (*Char. ampl.*)

Glans ossea, basi rotundata, parte superiori depressa vel interdum pulvinata, indumento raso tomentoso instrata, apice subumbonata, maxima pro parte cupula immersa, incomplete 4–5-locularis. *Cupula* lignosa, hemisphaerica, glande parum brevior, extus squamis ovato-triangularibus dense imbricatis vestita, intus glabra. *Semen* pendulum, totam glandem replens; *testa* membranacea; *embryone* exalbuminoso, orthotropo; *cotyledonibus* maximis, 4–5-lobis, rimoso-sulcatis; *radicula* supera.

Pars glandis quae cupulam eminet paulo obducta, ita ut, cupula abscissa, nux sit quadantenus phallimorpha. Fructus, sinice *shi li*, i.e. *castanea lapidea*, vel *king li*, i.e. *castanea Pekinensis*, e provinciis borealibus imperii Chinensis allatus, in foris oppidorum meridionalium hyeme venalis, saporem Castaneæ nostratis aemulat. Frustra hucusque specimina arboris viventia quaesivi.

* The same rose-coloured quartz sand I have seen, covering the bottoms of the Himalayan torrents.

Quercus thalassica ;

Foliis oblongo-ellipticis longe cuspidato-acuminatis integerrimis coriaceis glabris superne laete virentibus subtus pallidis, basi in petiolum folio 6-plo breviorem angustatis, floribus spicatis, spicis axillaribus densis cylindricis erectis 2–8 fasciculatis foliis plerumque paulo brevioribus, fructibus biennibus sessilibus, cupulis hemisphaericis suberoso-lignosis extus squamis plurimis arcte adpressis mucronatis cano-tomentosis vestitis intus albo-velutinis, glandibus maturis ad tres quartas longitudinis e cupulis emersis ovatis glabris sparse pruinosis spadiceis vertice (e reliquiis albentibus calycis laciniarum) umbonatis.

Arbor 20–30 pedalis et ultra, in silvulis insulae Hongkong Sinensium crescens.

Ipomoea fulvícoma ;

Simul repens et volubilis, caule laevi striato, foliis cordato-ovatis aut cordato-sagittatis acuminatis nunc integerrimis nunc subsinuolatis supra sparsissime pilosis subtus incano-pubentibus, petiolis pubescentibus, pedunculis subsecundis glabris petiolos ut plurimum parum superantibus 2-floris, sepalis subaequalibus obovatis costatis, corolla ——, capsula calyce cincta ovata glabra, seminibus subsphaericis fulvo-villosis.

Hab. Ad cautes litoricas ins. Hongkong.

BOTANICAL INFORMATION.

Dr. Thomas Thomson's *Scientific Mission to* Thibet.

(*Continued from page* 154.)

Kashmir, Oct. 5th, 1848.

On my return to Nubra, I found the crops ripe, and the barley for the most part cut. The buck-wheat and a few fields of millet were still green. As autumn was approaching rapidly, I lost no time in proceeding to Lé, as I was anxious to get to the Kashmir valleys

before the season for vegetation was at an end. On the pass near Lé, I got one or two new species of *Gentianaceæ*, and seeds of the *Primula* which I had gathered in flower in July. These I shall enclose, as the latter plant is very handsome, with a head of extremely large flowers, and does not seem to be described. I arrived at Lé on the 11th, and left it on the 15th of September, taking the most direct road to Kashmir, that by Dras. In the valley of the Indus, along which my road lay for about forty miles, the dry stony plains were now covered with *Chenopodiaceæ*, a family which constitutes the most conspicuous portion of the autumnal flora of these tracts. *Salsola* is the most numerous genus; of it there occur three species, and one each of *Corispermum*, *Echinopsilon*, *Eurotia*, *Ambrina*, *Atriplex*, and *Chenopodium*. Few plants of other tribes occur in any abundance. *Nepeta floccosa* is the only one which can be called common. In the cultivated and more fertile tracts, *Artemisiæ* or *Tanaceta* are very plentiful. I mention both genera, because I have not yet examined the flowers of any of the species attentively, and I do not know the limits of the genera sufficiently to refer them confidently from habit. At Kalatzo, the road leaves the Indus, entering the hills to the south of that river, and proceeding through lateral valleys at no great distance from it as it enters the Dras valley, not more than ten or twelve miles from its junction with the Indus. There were two low passes crossed, but neither of them rose into the alpine flora. Immediately on leaving the Indus, a considerable change in the vegetation was observed. The predominance of *Chenopodiaceæ* existed no longer: more than half of the species had disappeared. Many species, too, made their appearance which I had no where met with to the north of the Indus. Of these, *Caragana versicolor* is perhaps the most remarkable, for it is a truly alpine plant, and I think never descends below 13,000 feet. Indeed, though the genus is Siberian, no Indian *Caragana* occurs north of the Indus, though in the portion of Thibet adjoining Kamaon they seem to abound. Other species which are confined to the south of the Indus are remarkable, as European and Caucasian but not alpine species: they probably extend from Hindu Caucasus along the north side of the Himalayan range, not being capable of enduring either the heavy rains of the Indian slopes of these mountains, or the extreme aridity of Northern Thibet. Of these there are, I believe, many; though till the absolute identity of the species can be fixed by actual comparison, I

shall only mention *Thymus Serpyllum* and *Tauscheria lasiocarpa*, which appear to be quite identical with the European and Caucasian plants. At Kalatzo the bed of the Indus is about 10,000 feet; as I travelled west, the elevation of the valleys became gradually less, and where I entered Dras I was as low as 8,000. In the cultivated tracts below 9,000 feet, a number of species prevailed of decidedly Indian origin, which seem to creep up the valley of the Indus. These were an *Amaranthus* and some *Panicoid* grasses. I had previously met with an *Andropogon* of the *Iwarancusa* group in the valley of the Indus, and in Nubra a species of *Chloris*; and even as high as Lè (12,000 feet) a little *Cyperus* which seems to be *C. aristatus*, and *Andropogon Ischæmum* or an allied species are common. All these appear to me very interesting instances of the influence of dry climate and cloudless skies in producing in summer a subtropical temperature at very considerable elevations. In the moister climate of Nepaul or Java, I presume no such plants are to be seen at elevations of 9–12,000 feet.

After entering the Dras valley, my road was the same as that by which I marched from Iskardo to Kashmir in April. It follows the course of the Dras river to its source, and then descends suddenly into the Scinde valley, which is traversed by a tributary of the Behat or Kashmir river, which joins the latter about ten miles below the town of Kashmir. As I crossed the pass in April last, in the midst of a snow-storm, when the whole country was covered with snow, I had formed no correct idea of the height of the pass. Still I was not at all prepared to find that it did not exceed 11,300 feet, which is the result of an observation the other day. In fact the upper part of the Dras valley is without any perceptible rise, and the descent is extremely sudden. In this very low elevation I at once found the explanation of what had very much surprised me when I ascended the Dras valley, namely, that the vegetation very rapidly loses its Thibetan character, and consists for the last fifteen or twenty miles almost entirely of Indo-Himalayan plants, quite strangers to Thibet. Such genera as *Vernonia*, *Aconitum*, *Achillæa*, *Polemonium*, and the Kashmirian species of *Galium*, *Nepeta*, *Veronica*, *Delphinium*, and fifty others might be mentioned. Even *Prangos pabularia*, the characteristic plant of Dras (and plentiful in the Kashmir valley), cannot be considered to belong to the Thibetan flora. Birches and Kashmir willows creep up the sides of the mountains, and extend seven or eight miles on the Thibetan side of the

pass, but no Pines, for which I suppose the climate is still too dry. These last commence several hundred feet below the pass, and are plentiful in the Scinde valley, which is here elevated 9,000 feet, and produces a most luxuriant vegetation. For the open spots I was rather too late, as the rank herbage, rising to three or four feet high, was dried up; but in the dense birch woods, through which I penetrated with difficulty, I obtained many valuable additions to my collection. *Nepeta Govaniana*, *connata*, and others whose names I have not determined, *Aconita*, gigantic *Umbelliferæ*, and a multitude of *Compositæ*, luxuriated in these damp shady woods. During two days I collected upwards of a hundred species, of which twenty-five or thirty were quite new to me. I was more than anything struck with the occurrence of early spring species in full flower, in places from which the snow had only recently melted. In such places I gathered, on the 27th and 28th of September, *Primulæ*, *Thalictra*, *Myosotis*, an *Allium* (which in warm spots I found with withered leaves and capsules burst), a *Cerasus*, *Corydalis*, *Fragaria*, all hastening to expand, if possible, their flowers during the short summer yet left. In one place, close to a large patch of snow, a shrubby willow was still quite leafless, with buds just swelling. A little further off, the catkins were beginning to expand.

In the lower part of this valley, the autumnal vegetation was still luxuriant, though most of the species were familiar to me as Simla plants. In the open Kashmir plain, however, I have met with some novelty, but of course nothing which escaped Jacquemont. *Eryngium planum* was obtained by Royle's collectors; and I have a *Daucus* (perhaps *D. Carota*), two *Centaureæ*, a *Sium*, and some others. In the rice-fields which are now nearly ripe, *Alisma Plantago*, *Ammannia*, and *Cyperaceæ* of sorts are all plants of the plains. The other marsh plants which I have seen are *Lycopus*, *Lythrum*, *Marsilea*, *Myosotis palustris?* *Ranunculus aquatilis;* and when I visit the lake, which I have not yet done, I hope to gather many more.

7th October.—I am afraid you will think I have been far too diffuse in what I have written above, for however interesting to me, much of it must be familiar to you. I shall in future try to be more concise.

I seem to have, in one of my letters, made use of the name *Myrica esculenta*. I meant the common *Myrica sapida* of the Himalaya, which produces an esculent fruit, hardly, however, good eating. I do

not know whether the alteration of name was my own bad memory, or whether I met with the name I used in some book; but I have in vain searched for any such excuse for my mistake.

I have I think generally mentioned the species of grain which are cultivated. Wheat and barley are the most prevalent; the former both awned and awnless, it is sown in spring; the latter loose-coated (Sherokh). *Hordeum cœleste* seems confined to more southern parts. In Kashmir rice is the common crop; but Indian *Phaseoleæ*, maize, and millet also occur. The species of the latter I cannot venture to name at present, but I have preserved specimens. There are only two, one a *Panicum*, one a *Pennisetum*. With respect to fruit-trees, your question is exceedingly difficult to answer. The wallnut is unquestionably wild from Kashmir to Kamaon in the Indian Himalaya, and plentiful everywhere. In Thibet it is certainly only cultivated, but grows up to very nearly 11,000 feet. The whole tribe of Rosaceous fruit-trees are apparently wild in many parts of Kashmir, not in the valleys only, but in the forest along the hill-side; yet as they are extensively cultivated the point must ever remain doubtful. In Thibet, however, though I have once or twice seen an apricot and an *Elæagnus* on the river-bank far away from any cultivation, the circumstance has occurred so seldom that I feel sure it was accidental. The vine, or a nearly allied species, is wild in Kashmir as well as in Kishtwar, but I have not yet compared my specimens with cultivated ones.

T. THOMSON.

The late PROFESSOR ZUCCARINI. *From a letter addressed to the Editor by* DR. WALLICH, F.R.S., and L.S.

I have perused with great interest Professor von Martius's *Eloge* over Joseph Gerhard Zuccarini, delivered before the Royal Bavarian Academy of Sciences, at Munich, on the 28th of March 1848. Never was anything of the sort executed with greater taste and eloquence than this tribute of our excellent friend* to deceased goodness and

* In the Bulletins of the Academy for last year there are likewise, a discourse at its eighty-ninth anniversary, solemnized on the 28th March, and an *Eloge* over Berzelius, on the 28th November, by the same author: and I will add, an equally interesting *Eloge* on his son-in-law, Professor Michael Pius Erdl, by Dr. von Schubert.

worth. It is alike honourable to both. Gladly would I attempt an English translation of the whole discourse for your Journal, but time and talents are wanting to do it full justice. I cannot refrain, however, from giving you the following scanty gleaning, which, of course, you will make use of or not, according to your own judgment.

Zuccarini's claims as an accomplished and most meritorious botanist are well known. They have been detailed and explained faithfully, affectionately, and in energetic language, by the deceased's friend and colleague. He gives a rapid outline of modern botany, from the time "when Jung among the Germans, and Ray among the English, raised the ground pillars of true classification. They were followed by Tournefort and Linné. The latter, profound in thought and reflection, contemplating nature in all its aspects, fanciful and yet logical, awakened that methodical procedure in regard to the systematic part of the science of botany, which had occupied the whole eighteenth century. Towards the termination of this memorable epoch appeared Ant. Lour. de Jussieu, the founder of the so-called natural method, and our great countryman, Joseph Gäertner, the carpologist. These master minds, as well as all the others who exerted any influence on the systematical history of the vegetable kingdom—I name especially Micheli, Dillenius, Adanson, and Haller—contended for *the method*, each after his own fashion, with greater or less means of success." "Why is it (says our author, after dwelling somewhat on this period) that I attempt to point at the revolution which botany has undergone in the most modern times, and which will be succeeded by still more momentous changes in its fate? It is principally with this intention, to define with greater precision the period to which our lamented colleague properly belonged, and during which he so praiseworthily co-operated." He soon comes to the time of that most illustrious botanist, who is still—and long may he continue—among us; whom to name is to praise, and whose pre-eminence is acknowledged, *ultra invidiam*, throughout the world.

"Jussieu had not yet passed away when a genius arose, to whom is due the further development of his glorious labours. It was Robert Brown, with whom—the second Jussieu—De Candolle ranges as the Linné of our days. A host of talented men crowded round these mighty minds, uniting in the same aim, and among them was Zuccarini. The problem *now* was to attain,—from the frame work to the main structure,—from the abstract to the specific,—from the general

aspect of things, to an insight into their reality. It was Robert Brown who, above all others, shone as the leading star, by habitually, as it were, and in a manner quite unprecedented, throwing a flood of light over the path pursued by him in his researches into obscurities, enigmas, and difficulties. In this way the searching eye of the observer frequently ranged, in different directions, to even the remotest confines of the vegetable kingdom; and whoever would follow the master through the windings of this labyrinth, was sure to carry home with him an inexhaustible treasure of facts. Robert Brown applied to the more elaborate characteristic of families and genera the state of the flower, while yet in the bud; the relative direction and position of the parts of the flower towards the axis; the varied nature and development of the inflorescence; the properties of the anther and pollen; the position and progress of the development of the ovulum; the nature of the seed and the leaf-bud, &c., thus giving a degree of precision to the natural system, which had been unattainable before."

It was at this point of time that Zuccarini began to take an active part in botanical science, and especially in the progress of the natural system. His first labours were applied in working out the original notes of von Martius, for the first volume of the "Nova Genera et Species Plantarum Brasiliensium." The sentiments of our friend, on the occasion, are best expressed by the following passage, which I extract from the preface of that noble work. It is dated so far back as October 1822:—"Quia vero, ut ipse solus, quippe aliis simul negotiis distentus, librum hunc elaborarem, tempus non vacavit, dilectissimus et præclaræ industriæ juvenis, Zuccarini, Monacensis, botanicarum collectionum Adjunctus, analyses repetendas, plantarum earumque partium picturam curandam, descriptiones a me relatas in ordinem redigendas et supplendas, totumque opus mecum perficiendum suscepit. Huic igitur amatores botanices magnam hujus operis partem debent, pro cujus diligentia et cura grates publicas agere me animus impellit."

"The systematic activity alluded to above, was continued by Zuccarini in a series of dissertations, incorporated in the transactions of our Academy, treating detached genera or families monographically, or furnishing contributions to the universal stock of species, which the zeal of travellers have discovered in all parts of the world, and deposited in botanic gardens, or in herbariums. Of the former description are our colleague's labours in connection with

Oxalis, and the natural family of *Cacteæ;* to the latter belong four treatises, in which are described plants discovered by von Martius in the Brazils, by Boyer in Madagascar, in Mexico by the Baron von Karwinski, or brought back from their travels in the Levant by von Schubert, Roth, and Erdl. But Zuccarini's peculiar skill in the province of descriptive and systematic botany, was most beautifully exemplified in his publications on the flora of Japan. The distinguished physician and naturalist, Ph. Fr. von Siebold, after a sojourn of several years in Japan (1824 to 1830), had brought home materials for a vegetable history of that eastern island, far surpassing in their extent and scientific importance all that had heretofore been at the disposal of Cleyer, Meister, Kämpfer, and Thunberg. Not only a rich herbarium, but likewise numerous exact notes, taken on the spot by the zealous traveller, also communications from a native naturalist and his collections, and six hundred sketches and drawings of plants, executed by Japan artists, combined to give these materials extraordinary value; and they were, moreover, augmented by Dr. Bürger, who succeeded von Siebold at the factory at Nangasaki. It is more particularly the drawings, executed mostly under the immediate direction of von Siebold, that are prominently remarkable; for although their style reminds us of similar productions by Chinese artists, yet they are superior in their greater freedom of design, and a stronger expression of those characters, which constitute the foundation of correct systematic knowledge. The working out of these most important materials, the traveller confided to our colleague, who performed the part of editor with so much care and judgment, that the researches of these two naturalists into the botany of Japan, form a new and highly creditable epoch. This splendidly illustrated work, combining as it does elegance with accuracy of design and colouring, and the five memoirs published in the Bulletins of our Academy, will ever be looked upon as the chief foundation of the flora of that remarkable group of islands." "The number of phanerogamic species which Zuccarini has determined with certainty, is 1650, belonging to 621 genera, and 172 families. He thinks that the present materials will, on being thoroughly examined, yield a total of more than 2,400 species, belonging, perhaps, to 700 genera. Of all the known families of plants there are only seventy,—a small number in comparison with the area of the flora—which are not represented. A characteristic feature of this flora consists

in its abundance of plants yielding woods, or otherwise in use ; it is supposed to amount to 500 species. Japan, with China, Korea, and Upper India, constitute that complicated flora, which is chiefly significant by such important productions as the tea shrub, the camphor, and varnish trees, and rice. The flora of Japan, however, is most intimately related to that of China. These empires, as well as Korea, have had intercourse with each other from time immemorial, and they have therefore the same plants in cultivation. But the flora of Japan connects itself also to that of north-eastern India and the Himalaya, by a great community of genera, with a difference, and yet an affinity among the species. Another analogy is with the flora of North America ; that is, with the Atlantic portion of it. Several genera (*Negundo*, *Sassafras*, *Diervilla*, *Torreya*, *Pachysandra*, *Michelia*, *Maclura*, *Liquidambar*), hitherto considered as the exclusive property of the new world, have been proved by the researches of our colleague, to exist also in the old world. There is a striking affinity or community between the plants of the northern portion of the Japan Islands, and south-eastern Siberia and Kamtschatka. The flora of Japan has but a feeble relation to that of South America, and none at all with Africa and Australia ; while not a small number of its genera occur also in Europe."

Professor von Martius has entered into full details of the many and varied other labours of his colleague. They were scientific and profound, as well as practical and useful, in an eminent degree. Among the latter, are remarks inserted in the Bulletin of the Royal Academy of Bavaria, for Aug. 1835, on Dr. Royle's "Botany of the Himalayan Mountains," a work which contains a vast mine of information, requiring, in my humble judgment, only to be republished in a cheaper form, incorporating with it the additional materials in the "Productive Materials of India," of the same author, to obtain that degree of public usefulness, and full appreciation, to which it is so eminently entitled.—At the conclusion a list is appended of all the new genera established by the deceased in von Martius's "Nova Genera," in the works on the flora of Japan, and on other occasions.

The subject of the *Eloge* was born at Munich on the 10th August, 1797, from distinguished parents. He died on the 18th February, 1848. He dedicated himself in 1819 to botany under the tuition chiefly of his predecessor at the Botanic Garden at Munich, the celebrated Nestor of the science, Francis von Paula Schrank, "rei herbariæ in

Bavaria stator" as his monument fitly designates him, and of whom von Martius says in the opening sentence of his discourse, "Schrank had outlived the ordinary measure of human existence, and departed from a generation no longer his own: the praise and gratitude of his survivors declared his career to have been an uninterrupted and complete *chain of usefulness*.*

In all the private relations of life Zuccarini was amiable and highly respected. The intimate friend of seven and twenty years is entitled to speak in glowing language while depicting his character. He was honoured by the King of the Netherlands with the Order of Knight of the Lion; and very many scientific bodies rank his name among their ordinary or honorary members. A list of them is given by Professor von Martius; and I cannot more fitly conclude these inadequate extracts, than by inserting the following testimony of respect paid to Zuccarini's memory by the Linnæan Society of London, a month after the date when the *Eloge* was delivered. At a General Meeting of the Linnæan Society, May 2, 1848, it was moved by Dr. Wallich, seconded by Robert Brown, Esq., V.P., and carried unanimously:—

"That this Society has heard with deep regret, at the moment when about to ballot on the election of Professor Zuccarini as a Foreign Member, of his lamented death; and that a copy of this resolution, and of the certificate in his favour, be transmitted to his family."

Note on the recent Voyage of H.M.S. *Herald; by* Mr. B. Seemann.

Continued from p. 149.

We arrived at Panamà on the 19th of January, 1849, after an absence of nearly nine months; but pleasing though it was to see a place again so familiar to us, the state of the country was little calculated to allow any further intercourse than was absolutely necessary. The accounts of the newly discovered gold mines of California having reached the United States, had brought such a number of adventuring emigrants to the Isthmus for embarkation, that the usual conveyances, food, lodging, &c., failed. The emigrants, disregarding the rainy sea-

* The German word is "day's work."—N. W.

son of a noxious climate, had tried to overcome these obstacles by walking across, sleeping in the woods, eating quantities of fruit, and exposing themselves, unprotected by proper clothing, to the powerful rays of the mid-day's sun,—a sun that not unfrequently raises the temperature to 124° Fahr., forming a striking contrast to the snow-clad fields of Pennsylvania and Ohio, which they had just left. These causes tended to produce a cholera of the worst description, and it was for this reason that the 'Herald' communicated with Panamà merely through the Consulate, and that botanical excursions on my part were impracticable.

While here, I made the acquaintance of Mr. Von Warsewitch, a Polish botanist, who, enjoying the patronage of Alexander Von Humboldt, had been travelling seven months in the provinces of Panamà and Veraguas. From Panamà he went to Guayaquil in Ecuador, to extend his researches from thence to Cuzco, the ancient capital of the Incas.

Not being able to remain at Panamà, we spent several days at Taboga, the most delightful island in the bay. In its centre rises a hill about 1,000 feet high, cultivated with useful fruit and vegetables nearly to the summit, sending down little streams to the valley, where between palms and tamarind trees, the habitations of the natives are almost hid. Walking amongst the Mammee and orange groves, seeing the Nispero, the Alligator-pear, and the Mango-trees, loaded with fruit, or admiring the extensive Pine-apple plantations on the side of stony hills, fancy transports the stranger into the garden of the Hesperides; but however gratifying to the senses such a place appears, a collector is little benefited by it, and I was, therefore, glad to exchange Taboga for the coast of Veraguas, a more profitable field for botanical investigation.

I disembarked at Remedios, a large village, and the first thing I saw there were some men making ropes. The cordage generally used in the Isthmus is obtained from different plants belonging to *Columniferæ*. The best and whitest rope is made of the fibre of "*Corteza*" (*Apeiba Petoumo*, Aubl.). A brownish-looking rope, easily affected by damp (probably because the tree it is taken from contains much saline principle) is manufactured of "*Majagua de playa*" (*Hibiscus arboreus*); and a third kind is obtained from "*Barrigon*," an undescribed tree, which I have called *Bombax Barrigon*. The *Xylopia sericea*, St.

Hil., also yields a fibre fit to be made into ropes. It is on that account named "*Malaguetto Nembra*" by the natives, to distinguish it from *Malaguetto macho* (*Xylopia grandiflora*, St. Hil.), which is destitute of such a quality.

From Remedios my road led through an immense virgin-forest, the Montana de Corcha. It was here that I discovered another new species of *Pentagonia*, with leaves like those of *P. pinnatifida*, so that we now know three species of this interesting genus. They are equally distributed over the Isthmus. *P. pinnatifida* occupies the province of Darien; *P. macrophylla*, Benth., that of Panama; while *P. Tinajita*, as this third species might be called, is indigenous to Veraguas. The native name, "*Tinajita*," is taken from the fruit, which resembles the water-jars (tinajas) used in the country. Mr. Bentham, in establishing the genus, placed it amongst *Rondeletieæ*, supposing a bilocular *capsule* to be its fruit; but as *Pentagonia* has a bilocular *berry*, the inside of which is eatable, the *Gardenieæ* is the tribe of which it must be considered a member. The *Pentagonias*, growing in shady places on the banks of rivers and rivulets, are small trees (*arbusculæ*) from ten to fourteen feet high, with leaves of a considerable size, generally from one to three feet long, by six to twelve inches in diameter, red bracts, calyces and corollas, and berries eatable like those of the rest of the tribe, the *Genipas*, *Posoquerias*, &c. A tree (no. 1651), whose bark is employed against fever and tooth-ache, and is known by the Indian appellation of "*Corpachi*," is frequently met with in the woods. I take it to be *Croton Pseudo-China*.

I reached the town of David on the 14th of February, and proceeded the next day to Boqueti, a farm situated on the Vulcano of Chiriqui, four thousand feet above the level of the sea, from whence I made excursions in the neighbourhood, of which the collections now transmitted are the produce. Although I had visited the same place last year, I found now a number of plants unknown to me, and by a longer stay a great many more might be obtained.

The Vulcano of Chiriqui, the most elevated part of the Isthmus of Panama, is about seven thousand feet high, and presents a vegetation similar to that of the highlands of Mexico. The oak and alder are predominant. The genera *Salvia*, *Lopezia*, *Rubus*, *Fuchsia*, *Centradenia*, *Ageratum*, *Conostegia*, *Lupinus*, *Hypericum*, *Freziera*, *Galium*, *Equisetum*, *Euphorbia*, *Adiantum*, *Begonia*, *Clematis*, *Verbena*, *Inga*, *Solanum*, *Rho-*

pala, &c., are represented by one or more species. There are also several genera apparently new. One, belonging to *Eccremocarpeæ*, has an inflorescence like that of *Castilleja vulgaris*. A second, a *Rubiacea* (no. 1593), has remarkably long leaves, from one to two feet long, and bears greenish flowers. The two *Vaccineæ* found here do not seem to be described. One is a small tree with a rose-coloured raceme. The other approaches *Macleania*, but the calyx is smooth. A tree (no. 1612) very common in these regions, vernacularly termed "*Saumerio*," produces a resin that is used in churches as incense. To obtain it the tree is felled, and when in a state of decay the balsam is found collected in the branches,—the stem itself does not contain any. A *Rondeletia* (no. 1614), growing here to the height of eighteen feet, I found to have a bark that might be substituted for *Cascarilla*. It is very bitter, but the taste does not communicate itself so quick as is the case with *Cinchona* bark.

On the 1st of March I joined the ship at Boca Chica, the seaport of David. We proceeded from there to to the Paredes Islands, and to Punta Barica, to finish the nautical survey.

Towards the end of the month we are going to leave for the Sandwich Islands. B. SEEMANN.

LINNÆAN SOCIETY, May 24th. The Bishop of NORWICH, President, in the Chair.

On this day, the birth-day of Linnæus, the Anniversary Meeting was held. Mr. Forster, the Treasurer, being deceased, the report of the Finances of the Society was read by Mr. Yarrell, recommended by the Council to be elected to that office. The balance-sheet presented a favourable aspect. The Society's income amounted, during the past year, to £814 0s. 5d., which, added to the balance of last year, £69 5s. 8d., amounted to £883 6s. 1d. The Society's expenditure for the same period was £636 9s. 3d., leaving in the hands of the Treasurer a balance of £246 16s 10d.,—£177 11s. 2d. more than last year.

The Secretary then read an obituary notice of mournful interest, of the members deceased during the past year, including the names of the lamented Treasurer, Mr. Forster; Sir John Barrow, Bart.; Dr. Gardner, Director of the Botanic Gardens of Kandy, Ceylon; Alex-

ander Mackay, many years Secretary of the Society; William Horton Lloyd, Esq.; Professor Endlicher of Berlin who, it was stated, died of apoplexy, and had not committed suicide as reported; Dr. Graham; W. Pilkington, Esq.; Edwin Charlton, Esq.; Dr. Walters; Dr. Streeter; and two associates, Mr. M'Nab of the Edinburgh Botanic Garden, and Mr. Cameron of the Liverpool Botanic Garden.

A collection of dried *Algæ* was presented by J. Couch, Esq., and a new species of *Luzula* from the Isle of Wight by Dr. Bromfield. Dr. Hooker's magnificent work on the new Rhododendrons, recently discovered by him in Sikkim-Himalaya, was exhibited. Also a fine large portrait in oil, life-size, of Sir Joseph Banks, presented by Sir Everard Home, Bart. An admirable lithograph of the Right Reverend the President, forming one of a series of portraits of naturalists now in course of execution, was exhibited; and an engraved portrait of Captain Holman, the blind traveller, a member of the Society.

The following officers were elected for the ensuing year: President, the Lord Bishop of Norwich; Treasurer, W. Yarrell, Esq.; Secretary, J. J. Bennett, Esq.; Under Secretary, R. Taylor, Esq. The following five members of Council were removed: J. S. Bowerbank, Esq.; W. J. Broderip, Esq.; the Very Rev. Dr. Buckland; W. J. Burchell, Esq., D. C. L.; E. Forster, Esq., deceased; and the following five Fellows were elected: T. Bell, Esq.; F. Boott, Esq., M. D.; J. Gould, Esq., J. Hogg, Esq.; and R. H. Solly, Esq.

Botanical Society of London, May 4th, 1849.

John Reynolds, Esq., Treasurer in the Chair. Various donations to the Library were announced, and British Plants had been received from Mr. R. Embleton and Mr. T. Kirk.

Mr Thomas Moore communicated some remarks on a form of the sweet violet (*Viola odorata*), with mottled pale lilac flowers, found in the neighbourhood of Guildford, Surrey. This form was stated to be larger and more hairy than the common sweet violets (blue) of the same neighbourhood, and showed besides, the constant difference of having its sepals fringed with short hairs or ciliæ. In respect to this latter character, the author stated, that in all the white sweet violets he had opportunities of examining, he found similarly ciliated

sepals: whilst in the blue sweet violets, and in another form with flowers of a reddish-purple hue, he had as uniformly found the sepals to be quite entire. From these observations the author suggested that the white sweet violets, usually regarded as a mere variation of colour, might perhaps prove a *bonâ fide* variety, assuming the blue sweet violet with entire sepals to be the typical form of *Viola odorata.* In this view of the relations of the native sweet violets, the white, and the lilac-flowered fringed-sepaled plants would be considered as forms of a variety, to which the name *ciliata* would be appropriate; whilst the blue entire-sepaled plant would be regarded as the type of the species. It was mentioned that the white sweet violet had been set up by some botanists as a species distinct from *V. odorata.* Specimens of both forms were exhibited.

NOTICES OF BOOKS.

DE CANDOLLE; *Prodromus Systematis Naturalis Regni Vegetabilis. Pars Decima tertia, sectio posterior sistens Monochlamydearum ordines quinque.*

We announce, with great pleasure, another volume, or rather portion of a volume, of this most important work, perhaps the most practically useful on the subject that has ever appeared,—commenced by M. Auguste Pyramus De Candolle, and continued with undiminished excellence by his well-instructed son, M. Alphonse De Candolle, with the aid of some of the most distinguished botanists of the day.

The first part of the thirteenth volume is destined to contain the *Solanaceæ*, elaborated by M. Dunal of Montpellier, and the *Plantagineæ*, from the pen, if we mistake not, of M. Decaisne, but which are not yet prepared. The portion which is now published commences with the fourth subclass, *Monochlamydeæ* (from which, however, the *Plantagineæ*, *Plumbagineæ*, and *Coniferæ* are excluded). It includes the *Phytolacceæ*, reckoning twenty genera, by M. Moquin-Tandon: *Salsolaceæ* (*Chenopodeæ* of most authors), sixty-two genera; *Basellaceæ*, six genera; and *Amarantaceæ*, forty-five genera: all by M. Moquin-Tandon;—and lastly, *Nyctaginaceæ*, by M. Choisy.

Prospectus of a periodical publication for SCIENTIFIC BOTANY *and* ZOOLOGY: *edited for the Botanical department, by* ALEXANDER BRAUN, *and* CARL NAGELI; *for the Zoology, by* CARL THEODOR VON SIEBOLD, *and* SOLBERT KOLLIKER.

The editors intend, by this periodical (of which the botanical part is to be considered a continuation of that for Scientific Botany by M. J. Schleiden and Carl Nägeli), to excite a closer and more acknowledged cooperation in inquiries into the laws of organic life, by concentrating exclusively, into one publication, the many scientific labours of this nature, which are scattered about and mixed up with heterogeneous matters in many works.

To effect this object the editors consider it important to combine both botanical and zoological researches; because in this manner only can the common as well as the peculiar elements of animal and vegetable organization and functions become properly understood, and the true line of demarcation between the two kingdoms be defined. They desire to give their undertaking the highest possible character of science, and exclude, therefore, all accounts of new genera or species not absolutely conducive towards the main object defined above; as also all notices of simply natural-historical purport, or horticultural, medicinal, &c., unless they contain matter relating to, or throwing light upon, points of anatomy or physiology, especially morphology, comparative anatomy and histology. Thus also all literary events elucidating these topics will be duly noticed; but simple announcements of books, or extracts, or reviews, are beyond the object of the present undertaking.

With reference to this exposé, the editors solicit contributions, and promise speedy and correct publication with plates wherever required.

The publisher, Mr. William Engelmann, announces that two volumes are to appear annually, in four numbers; one volume of botany, the other zoology, each of about twenty-five sheets, and twelve neat lithographic plates. Price for both, 6 rthlr. (£1). To be had also separately, each volume for $3\frac{1}{3}$ rthlr.—(N. W.)

Leipzig, Feb. 10, 1848.

MIERS, JOHN, Esq.; *Illustrations of* SOUTH AMERICAN PLANTS. 4to. Part II. 8 plates, and Part III. 6 plates. London. Baillière.

Since our first notice of this valuable publication (Lond. Journ. of Bot., vol. vi., p. 62), two more fasciculi have appeared with plates full of the most careful analyses,—a continuation of the illustrations of the Nat. Ord. *Solaneæ*. Plate IX. exhibits *Pionandra* (*Eurythystemon*) *capsicoides*; Pl. X., *Sorema paradoxa*; Pl. XI., *Alibrexia rupicola*; Pl. XII., *Dolia vermiculata*; Pl. XIII., *Grabowskia obtusa*; Pl. XIV., *Metternichia Princeps*; Pl. XV., *Sessea stipulata*; Pl. XVI., *Cestrum Organense*; Pl. XVII., *Fabiana denudata*; Pl. XVIII., *Nierembergia rivularis*, and *N. hippomanica*; Pl. XIX., *Nierembergia stricta*, and *N. rigida*; Pl. XX., *Nierembergia linifolia*, and *N. anomala*; Pl. XXI., *Vestia lycioides*; Pl. XXII., *Nicotiana* (*Petunioides*) *cirrhoides*. Such a work as this leaves very little to be described of the Natural Family of which it treats.

HARVEY, W. H., M.D., &c. *The Sea-side Book, being an Introduction to the Natural History of the British Coasts.* 12mo. London, 1849. Van Voorst.

Of all the "Sea-side Books" we have ever seen, and we have seen many, this is the most agreeable and the most instructive, leading the mind, as it does, from "Nature up to Nature's God;" and yet the subjects it treats of are as truly scientific as they are popular. The book is illustrated with numerous wood-cuts, extremely well and faithfully executed. It lays open, in the clearest and most engaging language, the wonders of the great deep, and its boundaries,—"the sheltered bay—the open strand—the bold rocky barrier against which breakers constantly roll—each with its *peculiar animal* and vegetable inhabitant." An admirable introduction explains the design of the work, and six other chapters are devoted to "*the sands and their productions; the rocky sea-shore and sea-weeds* (here, as may be supposed, the author is peculiarly at home); *the rocky sea-shore and marine animals; dredging; the microscopical wonders of the sea; sea-side plants, birds, drift-wood,*" &c.

CHARÆ AUSTRALES ET ANTARCTICÆ, *or characters and observations on the* CHARACEÆ *of Australia and the Southern circumpolar regions; by* DR. ALEXANDER BRAUN.

Aquatic plants have been in general regarded as cosmopolites, which, unrestrained by the common limits of phytogeographical regions, are to be found with unchanged specific types in the most distant parts of the world. The following enumeration, however, by no means confirms this assumption, being confined to a series of quite peculiar species representing the family of *Characeæ* in Australia.

Robert Brown, in his *Prodromus Floræ Novæ Hollandiæ,* enumerates only two species of the family of *Characeæ.* I owe the knowledge of these, and a third not yet described New Holland species, to the kind communications of the celebrated author. In the year 1843, I published in the 17th volume of *Linnæa,* the Characeous plants collected by *M. Preiss,* in New Holland, by which the number of species known to this country amounted to eight. The most considerable increase, however, to our knowledge of the Australian *Characeæ* is due to the liberality with which Sir *W. J. Hooker* has opened to me his rich collections. Among other precious materials, I find there a most important series of *Characeæ*, collected on the Swan River by the indefatigable Mr. *James Drummond*; as well as several Antarctic species collected by Dr. *J. D. Hooker* during the voyage of the Discovery Ships *Erebus* and *Terror*, which are remarkably interesting from their analogy with those of the *northern* polar region. With these the number of the Australian species amounts to sixteen, or with the Antarctic ones, to eighteen. As I have remarked, all these species are peculiar to these countries, and to be found in no other part of the world. Only two of them have a near resemblance with species otherwise known, so that, by a less restricted definition of species, they might be regarded as varieties;—namely, *Nitella penicillata*, from Van Diemen's Land, which resembles much *N. gracilis* from Europe, and *N. Antarctica*, from Kerguelen's Land, which has great analogy with the northern *N. nidifica.* The most singular and curious species, both of the true genus *Chara* and of *Nitella*, are those from the Swan River. Although there have been found not less than ten species at that settlement, none of them shows the calcareous incrustation, characteristic of many of our European species, but all are smooth and pellucid, without any incrustation or

with a very inconspicuous one, as may be seen in *Chara Drummondii*. On the other hand, in many of those species, the superior whorls, which contain the fructification, are covered with a jelly, pellucid and very slimy, as is expressly noted in the manuscript communications of Mr. Drummond to Sir W. Hooker. In general I cannot help paying my tribute of admiration to the perspicacity and carefulness of Mr. Drummond in collecting these minute and difficult plants, the species of which, as well as the mostly separated sexes, he exactly distinguished, and even took the pains to detect germinating specimens of several of them.

In regard to the generic division of *Characeæ*, I remark, that I have found a sufficient character to distinguish the two genera of *Nitella* and *Chara*, originally founded only on the habit. This character consists in the construction of the stigma, or rather the coronula of the seed, which is formed by the summits of the five involucral leaves spirally involving the spores, and constituting the striated seed-vessel. This coronula consists, in the genus *Chara*, of five cells, which form a simple circle, and sometimes spread themselves in the form of a star; while, in the genus *Nitella*, the coronula consists of ten cells, forming two circles one lying above the other, and never spreading. Besides, the coronula of *Chara* is persistent, that of *Nitella* generally falling off before the complete maturation of the seeds. The character on which the genera *Chara* and *Nitella* were founded by Agardh, consisting in the coated (striated) or uncoated stems is not universally available: all *Nitellas*, indeed, have uncoated stems; but all *Charas* have not coated stems.

Each of these genera may be divided in two subgenera, according to the position of the antheridia or globules. In most of the *Nitellæ* they are terminal, that is, situated on the summit of the chief ray of the leaves (branches of the whorl), in the midst of the secondary rays, which form the furcated division of the leaf. This is the case in the true *Nitellæ*, *N. flexilis*, *syncarpa*, *translucens*, *gracilis*, *tenuissima*, &c. In some other species, as *N. nidifica* and *fasciculata*, the antheridia are placed laterally on the joints of the articulated chief ray of the leaves, between the lateral rays, which never attain the length of the chief ray. This subgenus I call *Tolypella*.

The genus *Chara* may be divided into *Chara*, in the stricter sense, in which the antheridium takes the place of one of the little foliola (commonly called bracteæ). In the monœcious species of this division

the seed is always placed directly above the antheridium. To this division belong the most numerous and commonest species, as *Ch. fœtida*, *hispida*, *ceratophylla*, *aspera*, *fragilis*, etc. All these have a coated or invested stem ; but the same division contains also uncoated species, as *Chara coronata*, which Ruprecht, in his additions to the Russian Flora, separates as a peculiar genus with the name *Charopsis*,* which separation is not applicable, some species varying with coated and uncoated stems. The other division of *Chara* is the subgenus *Lychnothamnus* of Ruprecht, in which the antheridia are placed in the inner part of the circle of foliola, and, being monœcious, therefore by the side of the seed. The species of this division are generally uncoated, and here are to be included *Chara barbata* and *alopecuroidea*.

According to this division, also, the diœcious species can easily be placed in the same arrangement. It is curious, that in New Holland the greatest number of species seems to be *diœcious*, while in Europe the monœcious species are far more numerous.

I now introduce the separate species, enumerating all subdivisions of the genera and subgenera, by which it can be seen which of them are represented in Australia, and which are not.

Genus I. NITELLA.

Subgenus A. NITELLA.

a, *Nitellæ furcatæ ;* foliis simpliciter (nunquam repetito) divisis, segmentis ex articulo unico formatis.

α, *homophyllæ ;* foliis verticilli 6–8 similibus.

β, *heterophyllæ ;* foliis minoribus inter folia 6–8 majora interjectis.

Of these divisions no species is found in Australia. To α, belong of European species N. *flexilis*, L., and N *syncarpa*, Thuill. ; to β, the South American N. *clavata*, Bertero.

b, *Nitellæ mucronatæ ;* foliis rarius simpliciter, plerumque repetito divisis, segmentis ultimis ex articulis 2, secundo plerumque mucroniformi, formatis.

α, *homophyllæ*, ut supra.

The European species belonging to this division are N. *translucens*, Pers., *mucronata*, A. Br., *exilis*, Amici, *gracilis*, Smith, *tenuissima*, Desv., *batrachosperma*, Reichenb. ; the Australian species are the following :—

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* *Charopsis*, Kützing, is composed of *Lychnothamnus*, Ruprecht ; and *Charopsis*, Ruprecht.

1. N. *microphylla*; monoica, caule tenuissimo, verticillis sterilibus paucis e foliis elongatis, apice breviter furcatis; verticillis fertilibus numerosissimis, remotis, minutis, densis, gelatinosis, e foliis 8 abbreviatis, medio simpliciter 4–5-furcatis, segmentis mucrone imposito conico breviusculo apiculatis; seminibus solitariis, coronula breviuscula, fasciis (a latere conspicuis) 9–10.

   Swan River, Drummond, No. 9, in herb. Hook.

   One of the least and most delicate species of the genus, resembling in its habit a tender N. *tenuissima*; but the fertile whorls are smaller, having in the diameter only about two millim., and invested with a tender pellucid jelly, being, however, not so thick as in N. *glœostachys* and *gelatinosa*. The nut of the seed is red-brown, .30–.32 millim. long.

2. N. *glœostachys*; dioica, caule tenui; verticillis sterilibus e foliis elongatis, apice brevissime furcatis; verticillis fertilibus approximatis, minutis, capitula elongata spiciformia gelatinosa formantibus, e foliis 8 infra medium simpliciter vel in uno alterove radio repetito 4–5-furcatis, segmentis mucrone conico acuminato breviusculo apiculatis; seminibus solitariis, coronula brevissima contorta, fasciis 9–10.

   Swan River (Drummond, No. 7, in herb. Hook.).

   Approaches in its habit N. *gelatinosa*, (No. 9,) but the fertile whorls form somewhat larger and more spicate heads of 2–2½ m. in the diameter. These little spikes are surrounded by a glossy and pellucid jelly, giving to the fresh plant, according to the observation of Drummond, a beautiful iridescent appearance. The seeds are somewhat less than those of the former, the nut of a more yellow-brown colour, .20–.30 m. long.

3. N. *subtilissima*; dioica; caule tenuissimo; verticillis conformibus, remotis, minutis, densis, subgelatinosis, e foliis 7 in radiis pluribus duplicato-furcatis, segmentis mucrone imposito elongato anguste conico et acutissimo apiculatis; seminibus solitariis oblongis, coronula brevissima, fasciis 8–9.

   Swan River, Drummond, No. 10. in herb. Hook.

   This species is still smaller and more delicate than N. *microphylla*, and after the East Indian N. *byssoides*, perhaps the least species of all the family. The seeds are more oblong than those of the preceding species, the nut of a dark red-brown colour, .24 m. long. It produces less jelly matter than the former.

4. N. *penicillata*, monoica ?, dense cæspitosa; caule tenui; verticillis

inferioribus remotis, laxiusculis; superioribus approximatis, densis; foliis 6 triplicato- vel (in verticillis supremis) duplicato-divisis, radiis primæ divisionis 6–8, ultimæ 4–5, articulis divisionis penultimæ in verticillis superioribus abbreviatis, segmentis ultimis mucrone imposito conico brevi apiculatis; seminibus subglobosis, coronula brevi obtusa, fasciis 6–7.

Van Diemen's Land, Gunn, 1832, No. 1002, in herb. Hook.

This species forms massy and compact tufts of a brown-green, or black-green colour, growing in company with *Chara australis.* The specimens being too much advanced in maturity and scarcely bearing fructification, I could not decide whether it was diœcious or monœcious. In the last case it will be difficult to separate it from the more condensed varieties of N. *gracilis*, a species which is spread over a large part of the earth. The seeds are scarcely larger than those of N. *tenuissima;* the brown nut has the length of .25–.26 m.

β, *heterophyllæ*, ut supra.

In Europe there is only one species of this division, namely N. *hyalina*, DC., a species which was long confounded with N. *tenuissima*. The New Holland species of this division are more numerous.

5. N. *biformis*; dioica; caule tenui; verticillis sterilibus et fertilibus minutis, inferioribus laxioribus, superioribus densis gelatinosis, in planta fœminea approximatis, in planta mascula graciliore remotis; foliis verticillorum 8, interjectis in verticillis inferioribus paucis minoribus, in planta mascula plerumque simpliciter, in fœminea in uno alterove radio duplicato-furcatis, segmentis mucrone conico breviusculo apiculatis; seminibus solitariis, coronula breviuscula, fasciis 8–9.

Swan River, Drummond, No. 8, in herb. Hook.

This species resembles the less and more condensed forms of N. *tenuissima*, having, however, still smaller whorls. In some characters it approaches to N. *microphylla* and *glœostachys*, but by the smaller leaves between the large in the inferior whorls it is allied to the following species. The male plant has a different appearance from the female, the whorls being less and more distant. The seeds are somewhat larger than in the preceding; the dark-brown nut with sharp angles is about .34 m. long.

6. N. *Lhotzkyi.*

Chara Lhotzkyi, *A. Br. in Linnæa*, 17. *p.* 114. *Plant. Preiss.* 2. *p.* 145.

7. N. ***heterophylla.***

Chara heterophylla, *A. Br. in Linnæa*, 17. *p.* 113. *Plant. Preiss.* 2. *p.* 145.

Of these two species the fructification is unknown.

8. N. ***congesta.***

Chara congesta, *R. Brown, Prodr. p.* 346. *A. Br. in Linnæa*, 17. *p.* 114. *Plant. Preiss.* 2. *p.* 146.

One of the most remarkable and easily distinguished species, which, since Robert Brown, seems not to have been collected again. It is probably diœcious, but I have not seen the male plant.

c, *Nitellæ flabellatæ;* foliis simpliciter, rarius repetito divisis, segmentis ultimis 3–4-articulatis. (Omnes homophyllæ.)

Europe possesses no species of this division, Australia two very distinguished ones; the third Antarctic species is allied in its habit to some species of the section *Mucronatæ*.

9. N. *gelatinosa*; dioica; caule validiore elongato; verticillis sterilibus remotissimis, e foliis elongatis apice trifurcatis, segmentis brevissimis depauperatis 3–4-articulatis; verticillis fertilibus minimis, densissime congestis, capitula minima oblonga gelatinosa, terminalia et lateralia, formantibus, e foliis 8–9 prope basin simpliciter divisis, segmentis 4–7, æqualibus, 3–4-articulatis, articulo primo elongato, sequentibus abbreviatis, ultimo obtusiusculo; seminibus solitariis, coronula breviuscula, fasciis 8.

Chara gelatinosa, *A. Br. in Linnæa*, 17, *p.* 115. *Plant. Preiss.* 2. *p.* 146.

β. *microcephala;* caule foliisque tenuioribus, foliorum sterilium segmentis elongatis, capitulis fructiferis minimis subglobosis.

Canning River, Preiss, 1841, No. 1880; at the *Swan River*, Drummond, No. 12, in herb. Hook.; β. at the *Swan River*, Drummond, No. 13, in herb. Hook.

One of the most singular species, in which the difference between the sterile and fertile whorls is the most remarkable. While the sterile leaves attain the length of one inch, the fertile ones, which form the little heads, are only about $\frac{1}{2}$ millimetre long, the whole heads being only 1 or $1\frac{1}{2}$ m. in diameter. The gelatinous covering of these little heads is in no species more developed. The seeds belong to the least in the genus, although they appear very large in comparison to the whorls which produce them; the dark red-brown nut of them is about .20 m. long. The antheridia are considerably larger than the seeds, being scarcely surpassed by the segments of the leaves which bear them.

10. N. *leptostachys;* monoica; caule tenuiore; verticillis sterilibus remotis, e foliis elongatis supra medium furcatis, segmentis pluriarticulatis; verticillis fertilibus minimis, in spicas elongatas basi interruptas gelatinosas congestis, e foliis 6–8 prope basin divisis, radiis nonnullis iterum 3–4-furcatis, segmentis plerumque triarticulatis obtusiusculis; antheridiis in divisione primaria, seminibus in secundaria solitariis, coronula obtusiuscula, fasciis. . . .

Swan River (Drummond No. 6, in herb. Hook.)

This species is more slender than N. *gelatinosa* and *glœostachys*, differing from both by the more elongated and interrupted spikes, and the monœcious fructification. It is invested like these species by a jelly-like covering, giving to it, in the living state, a beautiful iridescent appearance. The specimens are wanting in completely ripe seeds.

11. N. *Hookeri;* monoica; verticillis laxis, inferioribus remotis, superioribus in capitula laxe comosa congestis, e foliis 6–8 medio vel infra medium 2–3-furcatis, radio uno plerumque iterum diviso, segmentis ultimis elongatis ex articulis 3, primo elongato, reliquis abbreviatis et angustatis, mucronem acutum bicellularem formantibus; seminibus plerumque geminatim congestis, coronula brevi obtusa fasciis circiter 9.

Chara *australis*, Tayl., in herb. Hook.

In a little lake on *Kerguelen's Land*, collected in 1840 by Dr. Hooker. Besides this in Sir W. Hooker's herbarium there is a somewhat stronger sterile form, with simply divided leaves from *New Zealand*, collected by Mr. Colenso.

This species agrees in habit with N. *mucronata* of the middle and north of Europe, differing, however, by the swollen mucrones of the leaves. The dark red-brown or black-brown nut of the seed is about .42 m. long.

Subgenus B. Tolypella.

a, *Tolypellæ tricuspidatæ*, segmentis foliorum ex articulo elongato impositis pluribus mucroniformibus.

The species of this division known to me belong to South Africa, ex. gr. N. *Drègeana*, A. Br.

b, *Tolypellæ caudatæ*, segmentis ex articulis pluribus elongatis, sensim decrescentibus.

Of European species of this section are to be mentioned N. *fasciculata*, Amici, *prolifera*, Ziz., *glomerata*, Desv., *nidifica*, Müller. To the latter is nearly allied

12. N. *Antarctica;* monoica (?); caule elongato, nodis inferioribus valde incrassatis; verticillis remotis, superioribus laxe congestis, e foliis 6–9 inæqualibus, aliis indivisis, aliis simpliciter divisis, segmentis lateralibus terminali brevioribus, omnibus 4–5-articulatis obtusis; seminibus in foliorum geniculo primo congestis, magnis, fasciis 8.

Kerguelen's Land, collected by Dr. Hooker in 1840.

The specimens in Sir William Hooker's herbarium are in a state of decay, having lost part of their leaves and the greatest part of the seeds; I therefore cannot entirely decide if this species is really distinguished from N. *nidifica,* which is peculiar to saline water of the north of Europe, and particularly to the Baltic. The Antarctic plant seems to differ from it by a more slender habit, thicker nodes of the stem, and particularly by the larger seeds, which surpass in size those of all other *Nitellas,* the dark red-brown nut being $\frac{1}{2}$ millim. long. Finally the seeds appear to be placed only on the leaves, and not, as in N. *nidifica,* also at the base of the whorl.

Genus II. CHARA.

Subgenus A. Lychnothamnus.

13. Ch. *macropogon.*

A. Br. in Linnæa, 17, *p.* 116. *Plant. Preiss.* 2, *p.* 147.

Swan River, collected by Preiss and Drummond (No. 4 et 5 in herb. Hook.)

Among Drummond's specimens of this most curious species there is a little dwarf variety, of only three inches in length. To the description formerly given I will add the measure of the nut of the seed, length .64–.74 m., breadth .48–.52.

The European species of this subgenus are Ch. *barbata,* Meyer, *alopecuroidea,* Del., and *Wallrothii,* Ruprecht.

Subgenus B. Chara.

a, *Charæ haplostephanæ,* stipularum ad basin verticilli serie simplici.

a, *ecorticatæ,* caule foliisque ecorticatis.

14. Ch. *australis;* dioica, flexilis et pellucida, omnino ecorticata; caule valido; verticillorum foliis 6 validis, 3-articulatis, articulis subæquilongis, ultimo obtuso minutissime umbonato vel apiculato; stipulis ad basin verticilli minimis, adpressis, inconspicuis;

foliolis ad genicula foliorum minimis vel subnullis; antheridiis maximis æque ac semina in fundo verticilli et in geniculis foliorum aggregatis, seminum fasciis 8.

Ch. australis, *R. Br. Prodr. p.* 346. *A. Br. in Linnæa*, 17, *p.* 117. *Plant. Preiss.* 2. *p.* 148.

East coast of New Holland, R. Brown, in 1802–3; *Swan River*, Drummond, No. 11, in herb. Hook.; *Van Diemen's Land*, Gunn, 1832, in herb. Hook.

This large and striking species is nearly related to the East Indian Ch. *corallina*, differing especially by the diœcious fructification, by the imperfect structure of the foliola, and by the seeds and antheridia standing in clusters of two or three. It is transparent and glossy, without any incrustation. The seeds are, in comparison with the size of the plant, minute, scarcely so large as in Ch. *fœtida*, the dark-coloured nut being the length of ½ a millim.

15. Ch. *plebeja*, R. Br. ined.

A. Br. in Linnæa, 17, *p.* 118. *Plant. Preiss.* 2. *p.* 148.

Of this species only the male plant is known to me.

European species belonging to this division are Ch. *coronata*, Ziz., (*Braunii*, Gmel.,) and Ch. *stelligera*, Bauer, (*ulvoides*, Bertol.,) hitherto erroneously placed in the genus *Nitella*.

β, *corticatæ*, caule corticato, seriebus tubulorum corticis duplici foliorum numero.

* *gymnophyllæ*, foliis ecorticatis.

To this division belongs Ch. *Baueri*, A. Br., (Ch. *coronata*, Wallr., non Ziz.) a species nearly allied to Ch. *coronata*. The Australian species of this division bear no affinity to the European.

16. Ch. *Drummondii*; monoica, rigidiuscula, diaphana, tenuissime incrustata; caule stricto corticato, papillis sparsis inconspicuis munito; verticillorum foliis 10–12, omnino ecorticatis, 6-articulatis, articulo ultimo attenuato foliola geniculum ultimum coronantia parum superante; foliolis in omnibus foliorum geniculis verticillatis, quam semina duplo longioribus; stipulis duplici foliorum numero, minimis, coronulam verticillo appressam inconspicuam formantibus; seminibus solitariis, fasciis 11.

Swan River, Drummond, No. 1, in herb. Hook.

This species is nearly related to the two following, still more nearly, however, to Ch. *Hydropitys*, Reichenb., of East India and South America, from which it differs by its uncoated leaves, imperfect prickles

and stipules, and larger seeds. The nut of the seed is about .50 m. long, and .40 m. thick. The presence of a weak incrustation can be seen when exposed to hydrochloric acid arising out of carbonic acid.

17. Ch. *Preissii*; dioica, rigidiuscula, diaphana; caule stricto corticato, aculeis sparsis elongatis armato; verticillorum foliis 9–10, omnino ecorticatis, 5-articulatis, articulo ultimo attenuato foliola geniculum ultimum coronantia non superante; foliolis in omnibus foliorum geniculis verticillatis, quam semina duplo longioribus; stipulis duplici foliorum numero, elongatis, coronam simplicem verticillo appressam formantibus; seminibus solitariis, fasciis circiter 11.

Ch. Preissii, *A. Br. in Linnæa*, 17, *p.* 118. *Plant. Preiss.* 2. *p.* 147.

β. microptila, aculeis, stipulis et foliolis brevioribus, ventricosis.

Avon River, Preiss; *Swan River*, Drummond No. 2, in herb. Hook. Var. *β. Swan River*, Drummond, No. 3, in herb. Hook.

In this species by application of hydrochloric acid no carbonic acid appeared. The nut of the seed is without the calcareous covering peculiar to the greatest part of the true *Charæ*. Length of the nut .48 m., thickness .32.

18. Ch. *Hookerii*; dioica, rigidiuscula, diaphana; caule stricto corticato, aculeis subverticillatis brevibus ventricosis cuspidatis armato; verticillis numerosis concatenatis e foliis 10–11, 4-articulatis, articulo ultimo attenuato foliola geniculi ultimi superante; foliolis in omnibus foliorum geniculis verticillatis, e lata basi cuspidatis, erectis, quam antheridia (et semina?) multo brevioribus; stipulis duplici foliorum numero, abbreviatis, ventricosis, coronulam simplicem gibboso-ventricosis, coronulam simplicem verticillo appressam formantibus; antheridiis solitariis; seminibus. .

Van Diemen's Land, Gunn, 1832, No. 1001, in herb. Hook.

This species is distinguished by its peculiar habit. The stems are almost simple, the numerous whorls of short and somewhat incurved leaves form a long chain. From the preceding species it chiefly differs in the short and tumid prickles, foliola, and stipulæ, which are finely acuminated. The female plant is wanting in Sir William Hooker's collection.

* * *gymnopodes*, foliorum articulo infimo ecorticato, sequentium nonnullis corticatis.

To this division belongs Ch. *Hydropitys*, Reichenb., inhabiting East India and South America.

b. *Charæ diplostephanæ*, stipularum ad basin verticilli serie duplici.

α, *ecorticatæ*, caule foliisque ecorticatis.

β, *corticatæ isostichæ*, caule corticato, seriebus tubulorum corticis simplici foliorum numero (foliis corticatis).

To α belongs Ch. *denudata*, A. Br., from South Africa; to β, Ch. *imperfecta*, A. Br., from North Africa, and the European Ch. *crinita*, Wallr.

γ, *corticatæ diplostichæ*, caule corticato, seriebus tubulorum corticis duplici foliorum numero.

* *gymnophyllæ*, foliis ecorticatis.

* * *phlæophyllæ*, foliis corticatis, articulis superioribus nonnunquam nudis.

To * belongs Ch. *Kokeilii*, A. Br. and Ch. *gymnophylla*, A. Br. from the South of Europe; to * * Ch. *foetida*, A. Br. (*vulgaris*, Auct.), *contraria*, A. Br., *strigosa*, A. Br., *tenuispina*, A. Br., *papillosa*, Kütz., *hispida*, Auct., *Baltica*, Fries, *Rabenhorstii*, A. Br., *ceratophylla*, Wallr. (*tomentosa*, L.,) and some exotic species.

δ, *corticatæ triplostichæ*, caule corticato, seriebus tubulorum corticis triplici foliorum numero.

* *phlæopodes*, foliis inde a basi corticatis.

The European species belonging to this division are Ch. *aspera*, Willd., *galioides*, De C., *connivens*, Salzm., and *fragilis*, Desv. (*vulgaris*, L.,)

* * *gymnopodes*, foliorum articulo infimo ecorticato, sequentibus corticatis.

The species belonging to this division are all exotic, as Ch. *gymnopus*, A. Br., from Egypt, Ch. *Commersonii*, A. Br., from Isle de France and Bourbon, Ch. *polyphylla*, A. Br., with its varieties from East India, North and South America, Ch. *sejuncta*, A. Br., from South America, &c.

It is one of the singularities resulting from the preceding enumeration, that all the true *Charæ* of Australia belong to the division *Haplostephanæ*; while in all other parts of the earth the division of *Diplostephanæ* predominates, a division which seems entirely absent in Australia. In this manner the same law appears to be repeated in the little family of *Characeæ*, that prevails in the great divisions of the vegetable and animal kingdom in Australia, namely, the law, according to which even the most perfect types, having received the largest extension in other parts of the world, and especially in the old, are completely wanting, or scarcely represented in Australia.

Freiburg, Grand Duchy of Baden, March, 1849.

Some account of the VEGETABLE IVORY PALM (*Phytelephas macrocarpa*); by W. J. H. (Tab. VI. and VII.)

It is not for the first time we here make the observation that the vegetable products, best known in commerce, in the arts, &c., are frequently the least known *botanically.* A striking example in proof of this statement may be found in the fact, that familiar as every one is with the substance called *Vegetable Ivory*, Dr. Von Martius is obliged to bring to a conclusion his "Opus magnificum" on the Palms, without being able to figure, or even to describe from the life or from well-dried specimens, *the* species which yields this singular substance. The very last genus noticed in the work just mentioned is *Phytelephas*; and the author concludes his account of it with the remark: "Descriptio ex iconibus Gaudichaudianis et exemplari manco;" and these figures of Gaudichaud (Voyage de la Bonite) only exhibit the fructification, unaccompanied by any history or explanation.

We are far from expecting to fill up all that is wanting to the history of the *Vegetable Ivory*: our living plants are but young, and our own specimens, how superior soever they may be to those possessed by other botanical cabinets, are far indeed from being complete; for it is well known how difficult it is to procure available specimens for illustration of these "Princes" of the vegetable kingdom. The Royal Gardens, however, when sending out a collector to New Granada in 1845, did not fail to direct his attention to the importation of this plant; so that living specimens may now be seen in our stoves, and well-preserved specimens in various, but not in all states, in one of the cases of the Museum. From these, and from other sources, our brief history will be derived.

The first notice of the existence of the *Vegetable Ivory Palm* was given by Ruiz and Pavon, in their Systema Vegetabilium Floræ Peruvianæ et Chilensis, published at Madrid, in 1798. There, under the name of *Phytelephas macrocarpa*, we find the following account of its native names and properties:—

"It is called *Pullipunta* and *Homero* by the Indians of the hot and low valleys of the Andes of Peru, about Chanchamoya, Vitor, Cuchero, and San Antonio de Playa grande, its native locality,—*Palma del Marsil*, and *Marsil vegetal* by the Spaniards;—while the fruit, on account of its size and appearance, is called *Cabeza de Negro*. The Indians cover their cottages with the leaves of this most beautiful Palm. The fruit

at first contains a clear insipid fluid, with which travellers allay their thirst; afterwards this same liquor becomes milky and sweet, and it changes its taste by degrees as it acquires solidity, till at last it is almost as hard as Ivory. The liquor contained in the young fruits turns acid if they are cut from the tree and kept some time. From the kernel the Indians fashion the knobs of walking-sticks, the reels of spindles and little toys, which are whiter than Ivory, and equally hard, if they are not put under water, and if they are, they become white and hard when dried again. Bears devour the young fruit with avidity."

This species, *P. macrocarpa*, is characterized by having a "short caudex and very large heads of fruit," which distinguish it from a second supposed species "destitute of caudex, and with small fruit," *P. microcarpa*, possessing the same native names and properties.

Humboldt next detected the Palm in New Granada, especially common on the banks of the Magdalena, where it is known by the name of *Tagua*, and where, he tells us, "buttons are made from the hard bony perisperm of the seed." Gaudichaud, in the still unfinished Partie Botanique of the "Voyage de la Bonite," devotes three plates to the illustration of the flowers and fruit of what he deems several species of *Phytelephas* of Peru and Columbia; but being, as we have already observed, unaccompanied by any observations, we are ignorant on what grounds he rests his distinctive characters.

At what period these seeds, or "*nuts*," were first brought to England to be used by turners, &c., we have no means of ascertaining, nor to what extent they are now imported. Mac Culloch, in his Dictionary of Commerce, and Dr. Ure in his Dictionary of Arts, Manufactures, &c., are alike silent. But from the use that is made of them the amount is probably considerable; and in the turners' and toy-shops of London, may be purchased, for a shilling each, the nuts, or more properly speaking the seeds, either entire, or with one half of the coat removed by turning, so as to exhibit the beautiful ivory-like texture of the interior. The *entire* seeds, thus purchased, had been planted in our Garden; but they had never been made to germinate. Hence all due instructions were given to Mr. Purdie when he was sent on his botanical mission, some account of which is published in the Companion to the Botanical Magazine, and in relation to the *Phytelephas* or *Tagua* in particular, in the volume for 1847. We there learn that the Palm inhabits dense shady woods on hills facing

the Magdalena, in the Province of Ocana, at an elevation of 1,000 to 3,000 feet above the level of the sea; never growing in hot plains or level country. At the season when the flowering takes place, the country is said to be scented with its fragrance; and when the fruit is advanced all wild animals, especially hogs and turkeys, are extremely fond of it. "Enclosing the seeds," observes Mr. Purdie, "is a yellow sweet oily pulp, which is collected at the proper season (October) and sold, under the name of *Pepe del Tagua*, for one real a pound, at Ocana. A spoonful of it, with a little sugar and water, makes the celebrated *Chique de Tagua*, said to be the most delicious beverage of the country."

Some idea of the beauty of this Palm may be formed from our Tab. VI., lithographed from a drawing made and coloured on the spot by Edward Mark, Esq.,* H.M. Consul at Santa Martha, who obligingly communicated it for publication in this Journal.

The trunk, if trunk it may be called, is reduced to a short, nearly horizontal, and partially underground stem, or caudex, in our specimen about two feet long, but apparently very variable in size; and from the upper end of this arises a most graceful tuft of leaves twenty feet long, when fully grown, of a delicate pale green colour and pinnated or divided like the plume of a feather. The plant is diœcious, the male and female flowers being on separate plants, the male surrounded by an entire spatha, while that of the female is torn into shreds as the fruit advances to maturity. Both the one and the other spring from the inner base or axils of the leaves in clusters, and are thus described by Martius:—

Masc. "Spadix specie simplex, cylindricus, pedunculo squamis nullis instructo, rache floribus densissime obtecta. Flores in prominentiis racheos brevibus (ramis decurtatis) arcta glomerati, bractea et calyce minimis, sæpe delitescentibus. Bractea ovata concava. Sepala tria: duo lateralia majora, bracteæ similia, tertium posticum illis tectum. Stamina numerosa (36) e thoro. Filamenta filiformia. Antheræ lineares, erectæ, fere basifixæ, biloculares, connectivo mucronulatæ. Pollen ellipticum, longitudinaliter sulcatum. Fœm. Spadix simplex, squamis compluribus spiratim dispositis obsessus, vertice flores nonnullos gerens, inter squamas absconditos, qui constant pistillo et staminibus numerosis illud cingentibus, antheris sterilibus. Ovarium subglobosum, loculis

* To this hospitable gentleman our Garden owes much of the success that attended Mr. Purdie's Mission to the Magdalena.

aut 5 (quoque 3 aut 6?) uniovulatis. Stylus terminalis, erectus, apice tripartitus, cruribus subulatis, unico simplici rariusve bifido, binis bifidis, divisionibus intus stigmatosis. Ovula —? integumento duplici. Drupæ nonnullæ in capitulum maximum ponderosum aggregatæ, depresso-globosæ, deorsum cuneato-angulatæ, subpentagonæ, muricato-tuberculatæ et maturæ crasso-corticatæ, tuberculis sursum majoribus, longitudinaliter fibrosis et in parte supra verticem fructus convergentibus, quadri- et quinque- (et 3- aut 6-?) loculares. Semina in loculis solitaria, e fructus angulis centralibus oblique adscendentia, hilo magno convexo cicatricoso, oblongo-obovata, introrsum bifacilia. Testa crassa, ossea, lævigata; membrana interna vasis ramosis percursa. Albumen osseum, solidum. Embryo periphericus, juxta hilum sub-basilaris. Germinatio per chordam elongatam remotiva."—Mart. Palm. p. 306.

As already observed, our flowering specimens are not perfect, for Mr. Purdie was at the spot during the more advanced state of the fruit, and was thence enabled to send a bountiful supply of excellent seeds; thus I am unable to confirm the accuracy of the description of the parts of the blossom. One male spadix which we possess, exhibits a dense compacted mass of stamens, very much resembling the male flowers of *Freycinetia*; hence, probably, and from other peculiarities of structure, botanists have been led to refer the *Phytelephas* to *Typhaceæ* (Humboldt), others to *Pandaneæ* (Kunth, Endlicher, &c.), Ruiz and Pavon, Lindley, &c., to the *Palms*; while Von Martius in his very recently published number of his Palms, remarks:—"Genus, pro distincti ordinis typo a me habitum (Consp. regni Veget. p. 6) hinc Palmis inde Typhaceis et Pandaneis affine, a Gaudichaudio prioribus adjudicatum, quibus notis congruat, quibus differat et quo modo vicinis ordinibus nectatur, Botanicorum ulteriora studia docebunt;" and he places it along with *Nipa* (usually ranged under *Pandaneæ*) in a section of "Genera heteroclita: floris fœminei perigonio deficiente." Yet he does describe a floral covering, at least in the male flower.

The fruit of the *Phytelephas* will be considered of more interest by our readers than the flowers. It is represented at our Tab. VI., upon the entire plant, on a very reduced scale; and the young and perfect fruit (still upon a very reduced scale, about one quarter of the natural size, from specimens in the Museum of the Royal Gardens) together with the seeds, at our Tab. VII. The size of our large fruits is ten inches across, and twenty-five in circumference: they appear at

the base of the leaves on very short stalks, the great heads (*Cabeza de Negro*, like Negroes' heads, whence that name) resting on the ground, or lodged among the axils of the foliage, constituting a dry Drupe; that is, the covering to the seeds in an early stage is soft, fluid, or pulpy, but eventually dries up into a hard almost woody mass, 3–4 or 5-lobed, and everywhere embossed with conical, angular tubercles, something like the coat of a pine-apple: these tubercles, however, vary remarkably in size and length, giving an impression that there are several species of the genus. Within each lobe are several (the number would appear very uncertain) large, hard, smooth, oval or obovate, or almost sphærical seeds, of a greyish-brown colour, sometimes with the sides flattened by pressure, sometimes depressed. In this state they are sent to Europe, for it is they which contain the ivory-like substance. The outer coat, hard and crustaceous, is easily removed, when a thin brown skin appears, marked with anastomosing vessels, and distinguished by a hole or foramen, indicating the position of the embryo. Within this skin the whole is occupied, from the centre to the circumference with the exception of the small embryo, by the albumen, the food of the young plant, analogous to the white of an egg; and the albumen (which, in the cocoa-nut, is soft and fleshy, and eatable), is here firm and hard, in appearance exactly resembling ivory, hence employed by the mechanics as far as the size will allow, for various purposes in turning, &c., as a substitute for ivory, a much more expensive article. What is wanting in size, however, is often made up by the skill and ingenuity of the workman: when an article is turned it easily permits of pieces being added and united to it without the blemish being exposed to view; and where a lid is required for a box of Vegetable Ivory, a separate seed is used for the lid.

Thus we have another among many instances, of a vegetable product so nearly resembling, and exactly resembling to the eye, an animal substance (and that of a very distinct yet familiar character) as to be frequently passed off for such; and the generic name *Phytelephas*, (Ruiz and Pavon) will thus be found to be very appropriate, being derived from φυτον, a *plant*, and ελεφας, an *elephant*; for as the elephant is the ivory-bearing animal, so the *Tagua* is the ivory-bearing plant. Much, however, as the albumen of the seed of the *Phytelephas* resembles animal Ivory at the first glance, its internal organization is extremely different,

as may be expected. That of the seed of Palms, generally, has been admirably illustrated with figures and descriptions by Hugo Mohl; but that of the plant under consideration has especially occupied the attention of Professor Morren, of Brussels, in the second part of the first volume of "Dodonæa, ou Recueil d' Observations de Botanique, p. 74," from which we give the following extract; and we must refer to the plate itself of that work (Tab. II.) for the highly magnified appearance of this beautiful and curious structure, and to the several figures to which reference is frequently made:—

"The external covering of the ivory-nut (seed) is so hard as to be almost stony, yellowish-grey, smooth, and destitute of gloss: it is attached to a second coating, which is brown, porous, and dull, and is incorporated with it. Beneath a hollow, which separates these two integuments, is a third, brown, veined, warted and glossy covering, traversed by numerous fibres, under which lies the albumen, which forms the Vegetable Ivory. The Vegetable Ivory is of the purest white, and free from veins, dots, or vessels of any kind, presenting a perfect uniformity of texture, surpassing the finest animal ivory; and its substance is everywhere so hard, that the slightest streaks from the turning-lathe are observable, and cannot be erased till it is newly fashioned.

"When the article is carved, the Vegetable Ivory may be known by its brightness, and by its fatty appearance, whereon the well-skilled may discern the minute lines which are the beds of cells. Its structure would almost seem to show more analogy with bone than with ivory; but a microscopic investigation quickly proves that Vegetable Ivory possesses an entirely different structure.

"This structure is among the most curious in the vegetable kingdom.

"The external covering of the albumen is composed, as we proceed from the outside to the inside, of

"I. A layer of ovoid cellules, with brown thick parietes, the elongated centre of each cellule is filled with a darker substance.

"II. A second layer of ovoid cells, placed perpendicularly on the first, but with the innermost elongated, and approximating towards the structure of the next layer.

"III. A third layer of cells, still more elongated and fusiform, their parietes are thick and brown.

"IV. A fourth layer of smaller and prismatic cells, placed perpen-

dicularly and regularly over the preceding layer: they rest in their turn upon the last, which is

"V. A final layer of very dark and irregular cells, externally coated, on the side towards the albumen, with a brown colouring matter, which imparts its hue to the surface of the albumen, or Vegetable Ivory."

All the above-described organization belongs only to the integumentary system.

"The albumen, or Vegetable Ivory itself, is composed of concentric layers, of which only the most external differ from the most internal. When the albumen is hard, as was that which I examined, it presents a white substance, transparent in water, and which appears continuous, and not to be distinguished into various degrees of growth. It is perforated with an infinity of holes, the sections of so many cavities; the latter are irregularly rounded and also prolonged into arms or tubes, which give a starry appearance to the cavities, many of them being 5, 6, 7, 8, and 10-rayed. Here and there may be seen a little spheroidal cavity; finally the tubes appear to be each tipped with a small swollen head.

"Throughout the albumen the above-described structure is more or less regular, offering a beautiful study to the Vegetable-Anatomist.

"Generally speaking, the starry cavities are arranged in a quincunx, so that the interval between two of them corresponds to a third. A little attention also enables the observer to see that those rays, which are terminated by a little head, answer always to one another. The space between these heads is largest in a dry slice and least in a moist one. The central cavity is sometimes empty, and sometimes filled with a substance composed of very minute globules, reaching occasionally to the very tips of the rays.

"It is evident that these starry cavities represent so many hollows of cells, which still preserve their radii of communication, though the primitive parietes are obliterated; and in some instances, the cavities only remain in the form of ovoidal cells, which still can be restored to their original configuration by immersing the portion of albumen in Canada balsam. I have dried a carefully cut slice of the ivory, and then subjected it to the influence of Canada balsam, which rendered it so perfectly diaphanous as to be scarcely discernible by the naked eye from the balsam. This process has the effect of restoring the cells to

their normal structure: they become 6-rayed, the tubes correspond exactly with each other and every one is tipped with a swollen head, and more or less filled with the globular substance of which I have spoken. Thus we see revealed the whole organization of Vegetable Ivory, which is merely a prismenchyme with thickened cells, in which the rays of communication are preserved. The closest scrutiny has not enabled me to detect in the thick portion of the cells the smallest trace of those layers of growth which have been detected by M. Valentin, especially in the *Hoya carnosa* and *Oreodoxa regia*, &c.

"This substance, which appears continuous, is very analogous to that which MM. Schleiden and Theodore Vogel, in their researches into the nature of the albumen, have found in the albumen of *Phœnix dactylifera*; only that in the latter, there is no starry disposition of the tubes, and the hollows of the cells are elongated into two, or, at most, into three radii of communication."

M. Morren has well observed at p. 72; "l'ivoire qu'on retire de ces graines n'est autre chose que l'albumen qui, de laiteux qu'il était d'abord, d'albumineux qu'il était ensuite, a fini par acquérir la consistence du blanc d'amande pour passer enfin à l'état dur, élastique et blanc qui l' a fait comparer à l'ivoire."

It is a no less curious fact that this hard eburneous mass again reverts to its former soft state in the process of germination. This we have frequently had the opportunity of witnessing; our seeds were mostly sown in pots, one in each pot, and buried two inches or more under the earth. The first symptom of vitality is apparent by the protrusion of a strong stout fibre, which quickly takes a downward direction, and elongating some inches, produces from the opposite extremity a new *plant*, which soon developes itself in the air, while from its base the true roots descend (as shown in our figure, Tab. VII. fig. 3). Gradually the *seed* so recently buried, emerges to the surface, there lying on the earth; or more frequently, it is forced out of the pot, hanging over the edge and suspended by the strong fibre before alluded to, which thus forms a medium of communication by its vessels between the seed and the very base of the young plants (the collum) or point of junction of the root and stem. If at this time the seed be broken, the inside will be found to have become a soft substance, half pulp and half milk, which feeds the young plant, till it is old enough to derive its nutriment wholly from the soil, viz., when the plant is a

year or more old. If the seed be then tapped with a hard instrument its sound will indicate its emptiness; and the fracture of the shell will exhibit nothing in the interior but a little half-dried pulp, lining the inner integument of the seed. Henceforth the plant depends upon the soil for its nourishment and growth; and our individuals, now four years old, exhibit very much of the perfect character of the Palm, save in size, (for the oldest has no real stem,) the leaves with us being four feet long instead of twenty, as in the fully developed specimens.

References to the Plates.

Tab. VI. A scene upon a river-bank, exhibiting a *Phytelephas macrocarpa*, very much reduced.

Tab. VII. Fig. 1.—Cluster of young fruits, with torn and lacerated spathaceous covering, about one quarter of the natural size. Fig. 2, a fully formed fruit, with the coat partially broken to shew some of the seeds within; about one quarter of the natural size. Fig. 3, seed, natural size, in a state of germination. Fig. 4, section of a perfect seed deprived of its outer crustaceous coat, showing the anastomosing vessels, the foramen indicating the position of the embryo, and the hard ivory-like albumen. Fig. 5, represents an Indian toy made by the aborigines of El Equador (sent with several others by Prof. Jameson); the animal is presumed to be a *Lama*, or *Alpacha*, the usual beast of burthen, with a pack on its back: natural size. Fig. 6, a box turned from the albumen in London: natural size. (All these and many other specimens of the Vegetable Ivory Palm, may be seen in the Museum of the Royal Gardens of Kew.)

BOTANICAL INFORMATION.

On the growth in length of Bamboo shoots; by Professor von MARTIUS. Bulletin of the Royal Academy of Sciences of Munich. *No.* 33. *May* 12*th*, 1848.

Dr. Wallich, late Director of the Botanical Garden of Calcutta, has communicated to me, in a letter dated London, 24th Feb., 1848, a series of measurements, made with regard to the diurnal growth of several species of Bamboo in that Garden. They were made by the native head-gardener, Mooty-Oollah, a Mahommedan, who, with his late countryman, Kurreem-Khan, is spoken highly of on account of his knowledge. (After the latter a genus has been named *Kurrimia*, no. 4334 of the Lithograph Catalogue of the Herbarium of the East Indian Company, now in the Linnæan Society's Museum.) Although these daily measurements are unaccompanied by any data of the temperature, neither are there any anatomical enquiries, which, according to Schleiden (Elements of Scientific Botany, second edition, p. 437), are justly considered as requisite, especially the generation of new cells, and the extension and enlargement of existing ones, in order to obtain a correct insight into the process of growth and its periodicity; yet we consider these measurements, made in the East Indies, not without their interest. E. Meyer made measurements of the scape of *Amaryllis Belladonna* (Transactions of the Association for the promotion of Horticulture in Prussia, vol. v. p. 110) and stems of the Wheat and Barley (Linnæa, vol. iv. 1829, p. 98). Mulder has instituted similar ones on the leaf of *Urania speciosa* (Bydragen tot de nat. Wetensch., vol iv. p. 200); and Gräfe (Flora 1843, p. 36), on the scape of *Agave* (*Littaea*) *geminiflora*. But all these plants exhibit far smaller extensions than the colossal stalks of *Bambusa*, whose shoots (*Bam. gigantea*) grew not less than twenty-five feet, * nine inches (English) in length, during the thirty-one days of July, 1833; while a flower-scape of *Littaea geminiflora* in the Garden at Nymphenburgh, only grew 13½ feet from the 14th of August to the 10th of December, 1842.

* "These shoots (*Bambusa Tulda*, Roxb.) rise simple to their full size, from twenty to seventy feet in height, and from six to twelve inches in circumference in the course of about thirty days."—Roxb. Fl. Ind., vol. ii. (1832) p. 194.

Bambusa gigantea, Wallich. Length of Shootings.						*Bambusa Balcoa*, Roxb. The common Bengal Bamboo.			
1833									
July	1.	Morning	3″	Evening	3.25″				
..	2.	„	3.00	„	3.50				
..	3.	„	4.00	„	4.50				
..	4.	„	4.00	„	3.00				
..	5.	„	5.00	„	3.50				
..	6.	„	4.00	„	3.50				
..	7.	„	4.50	„	3.50				
..	8.	„	4.50	„	6.00				
..	9.	„	4.00	„	5.50	Morning	1.25″	Evening	1.00″
..	10.	„	3.50	„	6.00	„	1.50	„	1.25
..	11.	„	5.00	„	5.50	„	1.50	„	1.25
..	12.	„	5.00	„	6.00	„	1.50	„	1.75
..	13.	„	5.00	„	5.00	„	2.00	„	2.25
..	14.	„	5.50	„	4.50	„	2.50	„	2.75
..	15.	„	4.50	„	5.00	„	2.25	„	2.75
..	16.	„	5.50	„	5.50	„	3.00	„	3.00
..	17.	„	5.50	„	5.50	„	3.25	„	3.00
..	18.	„	5.50	„	7.50	„	3.50	„	3.00
..	19.	„	7.50	„	6.00	„	3.25	„	3.00
..	20.	„	5.50	„	5.50	„	3.00	„	3.00
..	21.	„	7.50	„	7.00	„	4.25	„	4.00
..	22.	„	7.50	„	7.00	„	4.25	„	4.00
..	23.	„	5.50	„	7.00	„	4.00	„	3.00
..	24.	„	7.00	„	6.50	„	3.50	„	4.00
..	25.	„	6.00	„	7.50	„	4.25	„	4.00
..	26.	„	5.25	„	5.00	„	4.25	„	4.00
..	27.	„	5.00	„	5.50	„	3.75	„	4.25
..	28.	„	3.50	„	5.50	„	4.25	„	4.00
..	29.	„	3.50	„	5.50	„	4.50	„	4.25
..	30.	„	3.00	„	2.50	„	3.75	„	3.75
..	31.	„	2.00	„	2.00	„	4.00	„	4.00
		Morning,	149.75	Eve.,	159.25	Total,	73.25	„	71.25
Total growth,			309.00″	or	25′ 9″.	or	6′ 1¼″	„	5′ 11¼″

Bambusa arundinacea, L. *Bansni Bans* of the Bengalese.

A slender shoot, measuring on the 24th of June, 1833, 4′ 8″ in length, and 4′ 75″ in circumference; with twenty joints, each with its leaf-sheath.*

Increase in length, in the Morn., 6 o'clock,		Eve., 6 o'clock.	Another shoot.† Morning.	Evening.	A third.
June 25.	2.75″		3.00″		3.25″
.. 26.	,,	8.00″		6.50″	8.00
.. 27.	3.00 ,,	4.00	3.50	3.00	2.75
.. 28.	3.50 ,,	3.00	3.75	3.75	4.00
.. 29.	3.00 ,,	4.50	2.75	4.50	3.50
.. 30.	3.75		4.00		
July 1.	3.00		2.25		
Total in 7 days, 38½″			Total in 7 days, 37″		In 5 days, 21.50″

Bambusa baccifera, Roxb.

		Another shoot.
1833, August 1st to 7th.	1′ 8″	1′ 6″
.. .. 8th ,, 14th.	2 2	1 8
.. .. 15th ,, 21st.	2 11	2 0
.. .. 21st ,, 28th.	3	2 6
Total in 28 days,	9′ 9″	Total, 7′ 8″

[As supplementary to the above interesting observations on the rapid growth of *Bambusa* in the East Indies, we may here mention that the same plant in the stove of the Royal Botanic Garden of Glasgow, has been ascertained to rise one foot in twenty-four hours. The leaf of *Urania speciosa* has been found by Muller to lengthen at the rate of from one and a half to three and a half lines per hour, and as much as from four to five inches per day. But the most remarkable instance of this sort, says Dr. Lindley, is stated by Junghuns, who has known the

* Dr. Wallich informs us that there is a mistake here. The girth (three feet above the base) and the number of joints have reference to the 1st of July.

† This was four feet high on the 24th of June. On the 1st of July it had a circumference of 4.75″, with about twenty joints and scales.

Bovista giganteum, a kind of Fungus, in damp weather, grow in a single night from a mere point to the size of a huge gourd; so that, supposing its cellules to be not less than $\frac{1}{200}$ of an inch in diameter, and it is probable they are nearer the $\frac{1}{400}$, it may be estimated to have consisted, when full-grown, of about 47,000,000,000 cellules; and supposing it to have gained its size in the course of twelve hours, its cells must have developed at the rate of 4,000,000,000 per hour, or of more than sixty-six millions in the minute.

In point of longitudinal development, perhaps the growth of the flower-stem of the *Agave* family is amongst the most remarkable recorded. We shall only here mention the *Agave vivipara*, Linn. (*Fourcroya gigantea* of recent authors) which blossomed in the Royal Gardens of Kew, in 1844. There were two ancient specimens in the greenhouse, which had shown no symptoms of flowering till the summer of that year, when each was seen to produce a flowering-stem, which at first resembled a gigantic shoot of young Asparagus, and grew at first at the rate of two feet in the twenty-four hours! So precisely did the twin plants keep pace with each other, that at the very time it was found necessary to make an aperture in the glass roof of the house for the emission of one panicle, (twenty-six feet from the ground,) a similar release was needed by the other. The rate of growth then most sensibly diminished; still in two months the flower-stalks had attained a height of thirty-six feet.]—Ed.

Notice on the Peninsula of Aden, by Dr. J. R. Roth. *Read before the Royal Academy of Sciences at Munich, on the* 15th of January, 1848. (*Bulletin of the Academy of* 24th February.)

The south-west point of Arabia Felix is terminated by three remarkable promontories, which, proceeding from east to west, follow each other in this way: Cape Aden, Cape Antonio, and Cape Bab-el-Mandeb; * Cape Antonio, in consequence of a slight bend outwards of the coast, being the southernmost. Beyond the straits, the Dschebel Sedschan rises in continuation of the Dschebel Manhali of this side; the island of Perim and some smaller ones intervening. These promontories form the projections, and also the highest points of an eminence,

* The author's orthography is retained throughout.

which, as part of the great coast-terrace of Hadramaut, connects it with the mountains of Jemen and Assyr, and running due east and west, is bounded by Cape Aden and Bab-el-Mandeb; projecting to the north, some projections and connecting chains, as we observed was the case with the first mentioned promontory. Between the two there are deep bays, the lower coast of which is still five to six miles (German) distant from the range of hills. The entrance is contracted by numerous rocky islands, sand-banks, and flats; and the promontory itself, broken and cleft in various ways, is skirted by detached rocks. The outline of the range presents, on the whole, little variety: it seems rising from the sea in the shape of terraces, and to end in a table-land, bounded to the north by the fertile mountains of Jemen, the real Arabia Felix. There are no valleys; but deep excavations break through the range, affording access to the table-land, and conveying torrents with stones to the coast in the cool season, during the few days of rain.

The eastern promontory, Aden, forms a heart-shaped peninsula, of which the diameter from east to west is one mile and a half (German). It is connected with the main-land by a low sand-bank, which is under water during the spring tides. To the westward of this neck of land a spacious bay extends, between the low coast of the main-land and the peninsula, which is the principal harbour, yielding protection and security to ships from all winds. A smaller bay lies to the eastward, with an open, unsafe roadstead, directly in front of the town of Aden, before which there is a small rocky island. The entire coast of the peninsula is variously indented with numerous creeks, especially on the south side, which is constantly washed or overflowed by the breakers.

Deschebel Schamschan, 1660 feet high, an extinct volcano, forms the centre of the peninsula, and has extended its basis to the circumference of the island, by its lava and stones. The summit, which has the form of a horse-shoe, open towards the east, embraces an almost circular plane, or valley, which may probably be considered as the former crater. The sides are extremely precipitous towards the inner curve, and almost perpendicular; externally, they are many-pointed and torn, and furnished with huge projections. The principal rock here, as well as in the mountains of Jemen and on the opposite African coast, consists of trachyte; frequently passing into

phonolith and amygdaloid, containing zeolite, feld-spar, and chalcedony. The phonolith contains cavities lined with a covering something like enamel. Lava of various thickness, and real scoriæ are scattered about in all directions, though rarely in solid masses on the surface, but mostly covered by volcanic tuffa and trasse, (trap?) including numerous shells. In boring for water at a considerable depth under the crumbling lava, they have been obliged to desist on account of the hard trap (basalt) which was encountered. The few wells that are in the valley have only yielded a fair permanent supply of water at a depth of 103 feet.

The indigenous plants are, on account of the aridity of the ground and air, limited to a few of the desert. Cultivation is out of the question, for want of means of irrigation. The largest tree is *Sterculia urens*, which occurs sparingly in the deep recesses on the western shore. *Poinciana elata* and *Acacia planifrons* appear, likewise, of considerable size, in bays of difficult access. Most of them are felled at an early age; *Balsamodendron Opobalsamum*, *Euphorbia triaculeata*, *Capparis carnosa*, *Cadaba glandulosa*, continue shrubby, covering beds of torrents; *Cassia lanceolata* and *angustifolia*, *Gynandropsis pentaphylla*, *Cleome angustifolia*, *Anastatica Hierochuntica*, *Psoralea bituminosa*, *Indigoferæ spec.*, *Staticis spec.*, are among the scanty, stunted vegetation, which is met with in more protected situations, affording some appearance of verdure during one half of the year. Corn and vegetables, as well as fodder, have all to be imported, partly by sea, from the African coast, and partly, in times of peace, from the continent. The coast to the westward is less barren than Aden; here are seen groups of palms and of shrubs consisting probably of *Rhamnus Napeca*, and *Acacia planifrons*.

The Akrabbi-Bedouins pursue some sort of agriculture far inland, out of the produce of which they carry to Aden the grain and straw of the Durrha. Excellent grapes ripening in May, oranges, lemons, figs, plantains, and dates, are brought from a short distance from the town of Lahadsch, to the north-west of Aden, where market supplies are yearly improving. The great demand and the lucrative sale of the produce at Aden have already had a most beneficial influence on the neighbouring Bedouin tribes.

The number of land animals and birds is still more limited than that of plants, with the exception of very troublesome rats, mice, and sea-

gulls. The *Inuus ecaudatus*, and a sort of fox, occupy the clefts among the rocks, where numerous turtles, owls, and hawks, likewise make their nests. Gazelles, hares, jerboas ("Springmäuse") mungozes, jackalls, and hyænas, are not uncommon on the adjacent continent. The Somaulis carry to the market, as butcher's meat, large flocks of the so-called Hedschas sheep, which is, however, peculiarly African; also some snub-nosed goats and Zebu-oxen. The supply of fish, as might be expected, is ample; besides the variegated sorts of the Indian seas, the *Chætodons* and *Labridæ*, which are quite innocuous as food, there exist some poisonous fishes, as *Ostracion* and *Tetrodon*; others are hurtful immediately before or during the spawning season. The sea abounds in all sorts of *Molluscæ*, while corals are never seen, on account of the strong surf.

Strangers find the climate very variable. The garrison, which is furnished from the Madras presidency, suffers less from sickness than at the Indian stations; and it is only the many privations Europeans must submit to on this sultry, unshaded rock, which urges them to curtail their residence there as much as possible. But probably at no great distance of time, they will establish villas and gardens on the continent, and render the hot town habitable, like those in Hindostan.

The death of Professor LEOPOLD TRATTINICK.
(*Bot. Zeit.*, May 4th, 1849.)

The Nestor of botanists, Professor Trattinick, Custos of the Imperial Cabinet of Natural History, died at Vienna on the 14th January last, at the advanced age of eighty-five years.

M. MORITZ WILLKOMM'S *Professional Tour.*
(*Supplement to Bot. Zeit. for* May 25th, 1849.)

Mr. Moritz Willkomm announces (under date, Leipzig, the 23rd of April) his intention of undertaking an extensive natural history tour through Spain, Portugal, and the Balearic islands, to occupy six-and-twenty months. The object of this protracted journey is to make geognostic, mineralogical and botanical researches in the least known parts

of the places mentioned. His plan and intentions are described at length; our space allows only of the following condensed heads. He sets out in the beginning of next August, for the Central Pyrenees;—September, the Northern Chain and Montanas de Burgos;—October, the Cantabrian coast;—November, Southern Galicia; —December, Lissabon;—January and February, 1850, at Lissabon and Situbal;—March, Algarbia, and Upper Alemtejas; April, Western Sierra Morena, to Sevilla and Cadiz;—May, Mountains of the Straits and of Serrania de Randa;—June, Lower Jenil valley, and Granada;—July, ibid, Central Sierra Morena, and the mountains of Mancha alta;—August and September, and October, Mountains between the Guadiano and Tajo, and the latter and Duero, Mountains of Northern Portugal;—November, Environs of Madrid;—December, Granada;—January and February, 1851, Granada, Malaga, and Cadiz;—March, Gulf of Gibraltar;—April, May, and June, the Baleares and Pithyuses;—July and August, through Southern Valencia and Murcia to East Granada;—September, Southern Iberian mountains;—October, return.

Mr. M. Willkomm thinks he may estimate his botanical harvest at not less than 3,000 species; but the saleable collections he intends limiting to 2,000 species of peninsular plants, as well as those of the Mediterranean and the Pyrenees and Alps. They will consist of Cryptogames and Phanerogames, to be disposed of in complete sets, of 2,000 species, or in centuries, according to the following prices:—

For a collection of 2,000 species	320 Fr.
Ditto single century	20
Ditto of select rare plants.........................	28
Ditto officinal or cultivated plants, very handsome and complete specimens	32
Half a hundred sorts of seeds	8
Ditto bulbs or tubers	16

None but subscribers can have collections of 2,000 species.

As the success of this scheme must mainly depend on the support of the public, M. Willkomm solicits the patronage of lovers of Natural History, and especially botany, to be announced to him before the middle of next month. The undertaking, finally, is strongly recommended by Mr. Schlechtendal.

Note from H. G. Reichenbach, fil.

The following notification is taken from Bot. Zeit., June 1st:—

"In order at once to meet idle reports, I hereby inform those gentlemen who have confided plants to my care, that not a leaf has been injured during the late fire at Dresden.* I had previously secured all property belonging to others, at the risk of my own life. Even my own collection suffered little (several musket-shots went through the packets); and in a very short time I shall be able to forward the few collections that are due.

H. G. Reichenbach, fil.

NOTICES OF BOOKS.

Martius' *Genera et Species Palmarum.*

After a long interval, occasioned no doubt, in part by the political events in Bavaria, and by difficulties over which the talented author had no controul, the ninth Fasciculus of this gigantic work has appeared, containing seventy-seven pages of letter-press, and about thirty plates, together with forty-nine pages of letter-press belonging to no. 7, given gratis, to supply the corresponding pages, printed on paper which had changed colour. We have here the assurance,—"Que l'ouvrage entier sera achevé en trois mois, car il ne restent à publier que peu de pages du texte et les titres et tables de matière." We shall gladly hail this event, and be proud to be able to notice the completion of the most splendid, and at the same time the most learned of all botanical works.

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* "An equally favourable report, I regret to say, cannot be given of the other botanical collections preserved there. The wax models of fungi, which were made at Vienna, under Trattinick's care, are destroyed: several old herbaria have been burnt; and Counsellor Reichenbach has lost part of his herbarium (especially his Cryptogamic plants) and many books."—Ed. of Bot. Zeit.

1. *Manual of Botany:* being an Introduction to the study of the Structure, Physiology, and Classification of Plants; by J. H. BALFOUR, M.D., F.L.S., and F.R.S.E., Professor of Botany in the University of Edinburgh. London, and Glasgow, 1842.
2. *The Botanical Text-book, for the use of colleges, schools, and private students:* comprising, Part I., an Introduction to Structural and Physiological Botany, and Part II., the Principles of Systematic Botany; by Dr. ASA GRAY, Professor of Natural History in Harvard University, third edition, New York, 1848.

We have had occasion to speak of Dr. Lindley's Introduction to Botany, and his Vegetable Kingdom, as, together, constituting the fullest and most perfect elementary work on botany that ever has appeared, alike honourable to the author and to the country that gave him birth; and it may be said that subsequent introductory publications on the same subject, however they may vary on minor points, are good or indifferent, according as they are wrought after this incomparable model. It has been the aim of more than one able botanist to condense such a vast mass of matter as has been here comprehended, in two large octavo volumes,* of more than 1800 pages, and to constitute a portable volume, more especially destined for a class book. Nor is the labour of preparing such a work light or the task easy; but it has been successfully accomplished by two well known professors of botany in a most satisfactory manner, and in a way which cannot fail to recommend the authors as most competent teachers, the one in the United States, the other in the capital of Scotland.

Dr. Asa Gray of the Harvard University, Massachusetts, has published the second edition of his Botanical Text-book, in 1848, for colleges, schools, and private students; but as we had occasion elsewhere to give this our unqualified praise on the appearance of the first edition, we mention the present one only incidentally; and now very recently has appeared the Manual of Botany, by Dr. Balfour, Professor of Botany in the University of Edinburgh. In the execution of the numerous woodcuts, we regret we must give the preference to the

* Our botanical readers cannot fail to know that the fourth edition of Dr. Lindley's Introduction to Botany, in two vols., appeared in 1848; and a second edition of the Vegetable Kingdom, was called for and prepared almost immediately on the appearance of the first: a crowning proof of the value of the book in general public estimation.

transatlantic publication; in point of matter and arrangement they are equally deserving of praise, and each forms a portable volume of some 500 or 600 pages. Dr. Asa Gray observes that "his compendious treatise is designed to furnish classes in our schools and colleges with a suitable text-book, as well as private students with a convenient introductory manual, adapted to the present condition of botanical science." Dr. Balfour in his Manual, says: "In the compilation of this Manual, the object has been to give a comprehensive view of all departments of the science. Attention is directed, first, to the elementary structure of plants, and the functions of the simplest tissues, and then to the compound organs, and the functions which they perform. In the consideration of these subjects the works of Jussieu and Henfrey have served as a model. The application of physiology to agriculture, both as regards the cultivation of plants and their diseases, is brought under notice: the works of Liebig, Mülder, and Johnston, having been consulted. In the important subject of classification much aid has been derived from the standard work of Lindley. The system adopted is that of De Candolle, but in the arrangement and definition of the natural orders, Walker Arnott has been chiefly followed. Many important hints have been derived from Henslow's excellent syllabus, as well as from the systematic works of Endlicher. In detailing the properties of plants care has been taken to notice all those which are important in a medical and economical point of view; Christison, Royle, Bennett, and Lindley, supplying valuable data. In the chapter on the geographical distribution of plants, a very general view is given of the principal facts brought forward by Meyer, Schouw, Humboldt, Berghaus, Watson, and Forbes; and in fossil botany the labours of Brongniart, Ansted, and Hooker, (J. D. H.) have been made available. The publishers placed at the author's disposal the wood-cuts of Jussieu's Cours Elementaire * and some from Beudant's Geology; and in addition to these, there are others taken from Raspail, St. Hilaire, Schleiden, Amici, and Maout."

From this extract, our readers may have some idea of the varied subjects treated of in the Manual. A great deal of valuable information is arranged under the respective families of plants, on their pro-

* Not surely of the French or Paris editions, in which the cuts are as superior to these, as are those of Dr. Lindley to Professor Gray's.

perties and economical and other uses, and a chapter is devoted to the Phyto-geographical division of the globe, including Schouw's Phyto-graphical Regions, and Meyer's Phyto-graphical Zones. Our knowledge of the distribution of vegetables is yet far too limited to enable us to draw anything like accurate limits and to found theories; but writers should be careful to collect what information does exist on so important a subject, if they would wish to avoid falling into very grave errors. Our attention was caught at p. 579 of the Manual by the observation that "the *Murrichi* or *Ita* Palm, the *Phytelephas*, or Ivory Palm, and the *Victoria regia*, are *peculiar to Guiana*. Now of the first the *Murrichi (Mauritia flexuosa)* the localities given by Kunth are:—"In pratis provinciarum Maragnamiensis, Paräensis, Fluminis Nigri: similibus locis provenit in Guiana Gallica, in Surinama, Berbice et Essequebo, in provinciis Cumanensi et Caracasana, ad ostia Orinoci et prope montem Duida: nec non in Peruviæ locis depressis reperitur secundum Pavonium." Of the *Victoria*, it has been explained (see Bot. Mag., under Tab. 4275–4278) that it has very extended localities in the still waters of the whole of the warm parts of eastern south America, in the same way as the *Nelumbium Jamaicense* occupies the Lagoons in the warm parts of Eastern America north of the line; while in regard to *Phytelephas*, some account of that interesting Palm, in the present number of our Journal, shows that there is no authority whatever for stating it to be a native of Guiana at all! It inhabits Peru and Columbia.

The illustrations of the natural families in Dr. Balfour's Manual chiefly relate to British or European individuals; those of Dr. Asa Gray mainly to American ones.

On the genus WITHANIA; *by* JOHN MIERS, Esq., F.R.S., F.L.S., &c.

WITHANIA.

This genus differs from *Physalis* in its fruticose habit, in its urceolate calyx, with long setiform teeth, enlarging with the growth of the fruit into a campanular shape, with a wide, open mouth, and becoming coriaceous in substance, not resolving itself into a globular bladder-like form, of thin reticulated texture, and concealing the berry. The corolla also differs in having a short funnel-shaped tube, somewhat longer than the tube of the calyx, with a border of nearly equal length, divided into five linear erect teeth, with obtuse summits, the stamens dilated at base and originating in a nearly annular adnate ring, the stigma is large and capitate, or rather sub-bilabiate, with a large two-lobed gland enclosed between the two rounded lobes. The embryo is helical and spiral, consisting of a whorl and a quarter. It approaches *Hypnoticum* and *Puneera* in the form of its corolla, but it differs from them in the structure and growth of its calyx.

WITHANIA, *Pauq.* (Char. Emend.) — *Calyx* urceolato-campanulatus, dentibus 5 longe setiformibus, demum auctus. *Corolla* breviter infundibuliformis, limbo 5-fido, laciniis linearibus, expansis, obtusis, tubo æquilongis, æstivatione valvata. *Stamina* 5, æqualia, corollæ tubo breviora, *filamenta* membranacea imo valde dilatata, in annulum sese fere attingentia et imo tubi adnata; *antheræ* oblongæ, cordatæ, acutæ, apicifixæ, 2-lobæ, lobis parallele connatis, longitudinaliter intus dehiscentibus. *Ovarium* oblongum, 2-loculare, placentis dissepimento utrinque adnatis, multiovulatis. *Stylus* simplex. *Stigma* capitato-bilobum. *Bacca* 2-locularis, calyce aucto coriaceo campanulato ore expanso inclusa. *Semina* pauca, pro mole magna, reniformia. *Embryo* intra albumen carnosum spiralis, teres, cotyledonibus semiteretibus, radicula infera ad angulum basalem spectante brevioribus. —Frutices *Hispanici, Algerienses et Canarienses*, foliis *alternis v. geminis, ovatis, aut oblongis, obtusis*, floribus *paucis, extra-axillaribus*.

1. *Withania frutescens*, Pauq. *Dissert. Bellad.* Atropa frutescens, *Linn. Sp.* pl. 200. Physalis frutescens, *DC. Flor. Fr.* vol. iii. p. 611. Hypnoticum frutescens, *Rodr.* Physalis tuberosa, *Cav. Icon.* vol. ii. tab. 102. — fruticosa, foliis ovatis sub-cordatis, sparse pubescentibus aut glabris, margine petioloque ciliatis; floribus 1–3, aggregatis, pedicellatis sub-extra-axillaribus — Hispania et Algeria.

The leaves in the specimens I have seen from Oran, are nearly circular, subcordate, somewhat emarginate at the apex, and nearly 1½ inch in diameter, on a slender canaliculate petiole half an inch long. The specimens from Spain have smaller and more ovate leaves. The berry is small, barely 2½ lines in diameter, with only a single seed perfected in each cell: it is enclosed in the campanular calyx with five expanding lobes, a wide open mouth, and of double its length and diameter: the seed is compressed reniform, about two lines in diameter. The lobes of the persistent calyx are rounded, coriaceous, and with the setiform apical termination often withered.

2. *Withania aristata*, Pauq. (*loc. cit*)—Atropa aristata, *Poir*. Physalis aristata, *Ait*: fruticosa, ramis compressis, angulatis; foliis oblongis vel rotundatis, subcordatis, apice obtusis, retusis, utrinque glabrescentibus, margine petioloque canaliculato ciliatis; floribus solitariis sub-extra-axillaribus, pedunculis lanatis.—Insul. Canariensibus.

The berry in this species is globular, about half an inch in diameter, encloses many seeds, and is tightly invested by the persistent calyx of equal length, which is almost entire, or at least, with five very short teeth, terminated by five setiform threads nearly equal in length to the calycine tube. The hairs seen in this and the foregoing species, are brachiate as in *Physalis* and *Hypnoticum*.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

(*Continued from p.* 175.)

Calcutta to Darjeeling in Sikkim-Himalaya.

My English friends would be amused to see me sometimes, when the boat has stuck in the middle of the Ganges, a not unusual occurrence if the wind blows hard and foul. The current, which runs three or four miles an hour, does not suffice to enable our floating cottage to be either tracked or pulled against such a wind. The banks are generally ten to fifteen feet above the level of the river; on one side they are sloping and sandy, on the other, precipitous and formed of hard alluvium. Withered grass abounds on both banks, Wheat, Dhal (*Cajanus*) and Gram (*Cicer arietinum*), *Carthamus*, Vetches, and Rice-

fields (now cleared of their crops) are the staple products of the country. Bushes are few, except the universally prevalent *Argemone Mexicana* and the *Calotropis.* Trees, also, are rare, and of stunted growth, *Fici*, the *Artocarpus* and some *Leguminosæ* prevail most. I have seen but two kinds of Palm, the Toddy Palm, and a *Phœnix*: the latter is characteristic of the driest locality. Then, for the animal creation, men and women and children abound, both on the banks, and plying up and down the Ganges. The Sacred Cow (of which the buffalo, called Bhil, is used for draught) is common. Camels we occasionally observe, and more rarely the elephant; ponies, goats, and dogs muster strong. Porpoises and alligators infest the river, even above Benares. Flies and mosquitoes are terrible pests; and so is an odious insect, the flying bug, which infests my cabin at night, and insinuates itself between one's skin and clothes, diffusing a dreadful odour, which is increased by any attempt to touch or remove it. In the evening it is impossible to keep the insects out of the boat, and hinder their putting the lights out; and of these the most intolerable is the above-mentioned flying-bug. Saucy crickets, too, swarm, and spring up at your face; whilst mosquitoes maintain a constant guerilla warfare, that tries the patience no less than the nerves. Thick webs of the gossamer spider float across the river, during the heat of the day, really as coarse as fine thread, and being almost inhaled, they keep tickling the nose and lips.

The native boat which I now occupy is not unlike a floating haystack, or thatched cottage: its length is forty feet, and breadth fifteen, and it draws a foot and a half of water: the deck, on which a kind of house, neatly framed of matting, is erected, is but a little above the water's edge. My portion of this floating residence is lined with a kind of reed-work, formed of long culms of *Saccharum.* The crew and captain amount to six naked Hindoos, one of whom steers by the huge rudder, sitting on a bamboo-stage astern; the others pull four oars in the very bows opposite my door, or track the boat along the river-bank. I have two servants, one, my factotum (Friday), alias Clamanze; and a mussulman, a table-attendant, who cooks and waits, is a handsome thin fellow, called Thirkahl. In my room (for cabin I cannot bring myself to call it) is my Palkee, in which I sleep, and to which Clamanze has fitted musquito curtains, a chair and table, at which I now write, and on it stands my compass and a huge pummalow, as big as a child's head,

(most wretched eating). The pummalow is the immense vapid orange of the East and West Indies, whose English name I cannot remember. On one side are all my papers and plants, under arrangement to go home; on the other, my provisions, rice, sugar, curry-stuff, a preserved ham, and cheese (which two latter are my luxuries), &c. Around hang telescope, tin botanical box, dark lanthorn, barometer, and thermometer, &c., &c. Our position is often *ashore*, and, Hindoo-like, on the lee-shore, going bump, bump, bump, so that I can hardly write.

I am fortunate in having to take this slow conveyance down, it costs me only about 10*l*. altogether, whereas the steamer would have upwards of doubled that sum, and I should have seen nothing on the road nor been able to write and arrange, as I can here all day long. Most grievously I need the time, especially for my notes, journal, and correspondence. I have been annoyed by the want of a collector: the whole trouble of gathering, drying, &c., has fallen on my own shoulders, with that of Clamanze, who has always plenty to do for me, and who, in Mr. Williams' camp, had to take his share of bullock-driving and transport of my goods. On the other hand the paucity of vegetation, burnt-up season, and absence of seeds or roots to collect, have allowed me to make a better illustrative collection of the botany of the countries passed through than I otherwise should have done. My specimens are well dried; this is not difficult with a little trouble: at this season three changings dry the majority, the difficulty being to prevent their drying too fast.

Nothing has surprised me so much as the drought of this part of India, and the absence of Epiphytal *Orchideæ* (I have but three), of Ferns and other Cryptogamiæ. The prevailing genus of Cryptogamia is *Riccia*! a species of which swarms everywhere in the beds of the river. Of water-plants I have a few, and some handsome species, a small *Vallisneria*, very different from *V. spiralis*, two *Villarsiæ*, and some *Potamogetons*. *Fungi* are extremely rare, I have but one Agaric: in spring they are said to be more abundant on the plains. Of *Mosses* only a *Fissidens*; no *Hepaticæ*, and very few *Lichens*.

With regard to things for the Kew Museum, I have done my best, but the scanty population of the districts I passed over is against much exercise of arts. One of the most curious things procured (and I think, ever seen) is a pair of bellows, made *entirely* of the leaves of a tree, and used for smelting iron by the aborigines of these

parts. Nothing can prove their poverty more strikingly; the article is about the size of a very large cheese, it has a bamboo snout, and is altogether a great curiosity. At the fairs I occasionally pick up beads, worn when under a vow or by the Brahmins, boxes, and such like, and all the gums and drugs I can procure. The number of the latter are legion, and I am puzzled how to set about collecting. I have got samples of about 250 kinds, with the Hindoo name on each; when I can, I write the Hindoo name in English and also in Persian, which character alone is to be relied upon, as the Hindoo wants vowels, and will admit of much ambiguity in pronunciation. I take to the fair or market, a lot of seed-papers, and make the merchant write the name outside in Hindoo; afterwards I take any opportunity of having this transcribed to English or Persian. Much of what I send is perfect rubbish, no doubt, and I had to consider my means in purchasing; hence a small sample may imply, either that I could not afford to buy more (as is the case of the kernel of the double Cocoa-nut) or that it was only worth purchasing the stuff for the sake of obtaining the name, and knowing it to be used in medicine (as the three dates, and many specimens of *dirt*). Of the cultivated grains, I also have got all I could; some may grow, as Dhal, Gram, &c., (probably none of the medicinal seeds will); others are only as prepared for use by the natives: as the split Dhal, prepared Rice. Of the Rice in ear, none is on the ground at this season, and I have procured small samples of each with great difficulty, chiefly from a Mr. Roberts at Ningapore: there are heads (ears) of twenty-six kinds, some of great beauty, and very different from one another, they will look well on paper in the museum. The number of things still to be bought at every market is infinite, and I shall go on amassing; but I have been only two months here now, and cannot bargain properly: it also takes a great deal of time.

The gale of this morning (March 18th) still continues and has become a dust-storm; the horizon is about twenty yards off, and ashy white with clouds of sand, the trees hardly visible, and every thing here in my boat covered with a fine coat of impalpable powder, which collects from the boundless alluvial plains through which the Ganges flows. Trees are scarcely discernible, and so dry is the wind that drops of water vanish like magic. What *Cryptogamiæ* could stand the transition from parching like this to the three months' floods at midsummer, when the country, for miles, will be under water?

March 23th.—Passed the mouth of the Soane, a vast expanse of sand dotted with droves of camels stalking along, and this being the eastern limit of their wanderings, I eyed the beasts with some interest. Soon after, the wide-spread spits of sand along the north bank announced the mouth of the Gogra, one of the vastest of the many affluents of the Ganges, and of the few foreign rivers which visit India, having its source in lake Mansorawar, in the far-away plateau of Thibet, 17,000 feet above its débouche here.

March 25th.—Arrived at Dinapore early this morning, a large military station, sufficiently insalubrious, particularly for European troops, the barracks being so misplaced that the inmates are suffocated. The buildings run east and west instead of north and south, and therefore lose all the breeze in the hottest weather.

Sent the boat down to Patna, and proceeded thither by land to the house of Dr. Irvine, an old college acquaintance, and excellent botanist, from whom I received a most kind welcome. On the road, Bengal forms of vegetation, to which I had been for three months a stranger, reappeared; likewise groves of Fan and Toddy Palms, which are both very rare higher up the river; clumps of the large Bamboo (*B. Balcowa*? Roxb.), Orange, *Acacia Sissoo*, *Melia*, *Uvaria longifolia*, *Spondias mangifera*, *Odina* and *Euphorbia antiquorum*, and *neriifolia*? *trigona*? and *Indica*, all these were common road-side plants. In the gardens, *Papaw*, *Croton*, *Jatropha*, *Buddleia*, *Cookia*, *Loquat*, *Litchi*, *Longan*, all kinds of *Aurantiaceæ*, *Tabernæmontana*, *Plumiera*, and the Cocoa-nut, all for the most part from their presence, and many from their profusion, indicating a decided change of climate, a receding from the desert north of India, and its dry winds, and our approach to the damper regions of the many-mouthed Ganges.

My main object at Patna being to see the Opium *Godowns* * (stores), I waited on Dr. Corbett, the Assistant-Agent, who kindly explained every thing to me, and to whose obliging attentions I am much indebted.

The E. I. Company grant licences for the cultivation of the poppy, and contract for all the produce at certain rates, varying with the quality. No opium can be grown without this license, and an advance equal to about two-thirds of the value of the produce is made to the

* Godown is a store-house; hence a burying-ground is called the "Parson's godown" by the natives.

grower. This produce is made over to district collectors, who approximately fix the worth of the contents of each jar, and forward it to Patna, where rewards are given for the best samples, and the worst condemned without payment; but all is turned to some account in the reduction of the drug to a state fit for market.

The poppy flowers in the end of January and beginning of February, and the capsules are sliced in February and March, with a little instrument like a saw, made of three serrated plates tied together. I send you one which Dr. Corbett kindly got for me, and a dry poppy-head, as incised: the produce is collected in jars. The cultivation is very carefully and well conducted, nor are there any very apparent means of improving this branch of commerce and revenue. During the N.W., or dry winds, the best opium is procured, the worst during the moist, or E. and N.E., when the drug attracts moisture and a watery bad solution of opium collects in cavities in the substance of the drug, and is called Passæwa, according to the quantity or absence of which the opium is generally prized.

At the end of March the opium jars arrives at the Godowns by water and by land, and continue accumulating for some weeks. Every jar is labelled and stowed in a proper place, separately tested with extreme accuracy, and valued. The contents of all are thrown into vast vats, occupying a very large building, from whence the mass is distributed, to be made up into balls for the markets.

This operation is conducted in a long paved room, up and down which the workers sit; every man is ticketted, and many overseers are stationed to see that the work is properly conducted. Each workman sits on a stool, with a double stage before him and a tray. On the top stage is a tin basin, containing opium sufficient for three balls, in the lower another basin, holding water. In the tray stands a brass hemispherical cup, in which the ball is worked. To the man's right hand is another tray, with two compartments, one containing thin pancakes of poppy petals, the other a cup-full of sticky opium-water, made from refined opium. The man takes the brass cup, and places a pancake at the bottom, smears it with opium-water, and with many plies of the pancakes makes a coat for the opium. Of this he guesses at one-third of the mass before him, puts it inside the petals, and agglutinates many other coats over it. The balls are again weighed, and reduced or increased to a certain weight, if unequally made up. At the day's end, each man takes his work to a rack with numbered

compartments, and deposits it in that which answers to his own number. From thence the balls are carried by boys to the drying-room, each being put in a clay cup, and exposed in tiers in the enormous building called the drying-room, where they are constantly examined and turned, to prevent their being attacked by weavils, which are very prevalent during north-east winds, little boys creeping along the racks all day long, for this purpose. When dry the balls are packed in two layers of six each, in chests, with the stalks, dried leaves and capsules of the poppy plant, and sent down to Calcutta for the opium market, whither every ball is exported. A little opium is prepared of very fine quality for the Medical Board, and some for general sale in India; but the proportion is trifling, and such is made up into square cakes. A good workman will prepare from thirty to fifty balls a day, the total produce being 10–12,000 a day; during the working-season 1,353,000 balls are manufactured for the China market alone.

The Poppy-petal *pancakes*, each about a foot radius, are made in the fields by women, and merely by the simple operation of putting the petals together. They are brought in large baskets, and purchased at the commencement of the season. The liquor with which the pancakes are agglutinated together by the ball-maker, and worked into the ball, is merely inspissated opium-water, the opium of which is derived from the condemned opium, "Passæwa," the washing of the utensils, and of the workmen, every one of whom is nightly laved before he leaves the establishment, and the water is inspissated. Thus not a particle of opium is lost. To encourage the farmers, the refuse stalks, leaves, and heads are bought up, to pack the balls with; but this is far from an economical plan, for the refuse is difficult to keep from damp and from insects, especially during the prevalence of damp winds, which are as favourable to the multiplication of weavils here as in England.

A powerful smell of opium of course pervaded these vast buildings, which Dr. Corbett assures me does not affect himself or assistants. The men work ten hours a day, becoming sleepy in the afternoon; but this is only natural in the hot season, with or without opium: they are rather liable to eruptive diseases, possibly engendered by the nature of their occupation.

Even the best East Indian opium is inferior to the Turkish, and owing to peculiarities of climate, probably will always be so. It never yields more than five per cent of morphia; whence its

Even the best East Indian opium is inferior to the Turkish, and owing to peculiarities of climate, probably will always be so. It never yields more than five per cent of morphia, whence its inferiority, but is as good in other respects, and even richer in narcotine. Dr. Royle is mistaken in supposing that any Indian opium has been raised equal to the Turkish.

The care and attention devoted to every department of collecting, testing, manipulating, and packing, is quite extraordinary; and the result has been an impulse to the trade, beyond what was even anticipated. The natives have been quick at apprehending and supplying the wants of the market, and now there are more demands for licenses to grow opium than can be granted.

All the opium eaten in India, is given out with a permit to licensed dealers; and the drug is so adulterated before it reaches the retailers in the bazaars, that it does not contain one thirtieth part of the intoxicating power that pure opium does.

Opium has been a source of enormous revenue to the East India Company, and is still by far its most profitable export. How long it will remain so is now the problem; already the market-value is considerably fallen, and the Chinese are practising the cultivation of the drug very extensively, and any differences with that Empire are disastrous to the opium-dealers. Under no circumstances can it be expected that China will eventually maintain the ambiguous policy of covertly promoting the import of a pernicious drug, at an enormously high price, the consumption of which she forbids. Her interest plainly is to enforce this prohibition, or to remove it and grow the Poppy in the Celestial Empire. I need not trouble you with the *vexata quæstio* of the moral right which the Company have to encourage the traffic in this narcotic, in defiance of a nation with which we are at peace, and to whose prejudice it is cultivated.

This is but a meagre sketch of all I saw and learned this morning; for not only is the subject and its preparation most interesting, but as a public concern I was much struck with the perfect order and regularity and the completeness of the whole arrangements, whether in the scientific department, the mechanical department or the financial. Dr. Corbett, too, had the tact of putting it all in the simplest and clearest view, and I wish that I did justice to his excellent practical lecture.

Decades of Fungi: *by the* Rev. M. J. Berkeley, M.A., F.L.S.

(*Continued from p.* 104.)

Decades XXIII. and XXIV.

North and South Carolina Fungi; by the Rev. M. J. Berkeley and the Rev. M. A. Curtis.

221. *Pol.* (anodermei) *fissilis*, Berk. and Curt. albus; pileo dimidiato vertice elongato rugoso hic illic aculeato-setoso; intus fibroso-fissili insigniter zonato; poris mediis subrotundis acie obtusiuscula. Curt. No. 1441.

Hab. On old stumps. North Carolina.

Pileus 6 inches broad, 2 long, or including the elongated vertex, $3\frac{1}{2}$, dimidiate undulated, rugose, with numerous raised lines, which are sparingly aculeato-setose; substance splitting into fibres zoned throughout. Pores about $\frac{1}{50}$ of an inch broad, subrotund; edge rather obtuse.

A fine species belonging to the same section as *P. spumeus*, remarkable for its strongly zoned highly fibrous substance; the nearest ally is *P. borealis*, but it has larger pores, firmer dissepiments, and a more fibrous texture.

222. *Favolus curtipes*, Berk. and Curt.; pileo tenui reniformi carnoso-rigido glabro; stipite brevissimo disciformi; poris mediis sinuatis plicatis. Curt. No. 1544.

Hab. On dead trunks. Santee River. Mr. Ravenel.

Pileus reniform, 2 inches broad, $1\frac{1}{2}$ long, quite smooth, rigid, and tawny when dry. Stem extremely short, disciform. Pores $\frac{1}{36}$ of an inch broad, pale, undulated, and crisped; edge white.

An extremely pretty species, resembling *F. cucullatus*, Mont., but the pores are less rigid and smaller, and the substance more fleshy.

223. *Merulius incrassatus*, Berk. and Curt.; effusus resupinatus, crassus margine breviter reflexo; plicis poriformibus. Curt. No. 1504.

Hab. On pine stumps. South Carolina.

Effused for several inches, resupinate, with the margin shortly reflexed, dirty white, and slightly silky. Substance thick, fleshy. Folds forming minute shallow brownish pores.

Allied to *Merulius tremellosus*, but thick and fleshy with minute pores. *Merulius confluens*, Schwein, which agrees in the fleshy pileus, has evidently a very different hymenium, and is more allied to *Cantharellus crispus*, and *C. retirugus*.

Arrhytidia, *n. g.*

Hymenophorum a mycelio mucedineo contexto formatum marginatum, tectum hymenio ceraceo molli lævi sine plicis. Sporæ oblongæ.

224. *Arrhytidia flava*, Berk. and Curt. Curt. No. 1349.

Hab. On dead pine branches. South Carolina.

Forming little scattered, sometimes confluent patches, one-third of an inch broad, consisting of a white mycelium, which forms a distinct border to the smooth orange yellow hymenium, sometimes the border is double. Spores oblong, fixed obliquely at the base.

This has just the habit of *Psilopezia*, but is without *Asci*. It is a distinctly bordered, mostly Pezizæform *Merulius*, destitute of folds.

225. *Hydnum pulcherrimum*, Berk. and Curt.; dimidiatum crassum lobatum spongiosum carnoso-fibrosum hirsutum intus zonatum margine tenui; aculeis breviusculis subulatis. Curt. No. 1648.

Hab. On decayed logs. Santee River. Mr. Ravenel.

Pilei white, with a pale tawny tinge, subimbricated, 6 inches broad, 3 inches long, 2 inches thick; dimidiate, somewhat lobed, carnoso-fibrous, of a soft spongy consistence, clothed with copious stiff down, which is more or less matted, sometimes as if gummed together; substance slightly zoned. Teeth subulate, 1–2 lines long, tawny.

This splendid species is closely allied to *H. septentrionale*, but is smaller, far less imbricated, and clothed with much stiffer hairs. The general structure is precisely that of *Pol. hispidus*.

226. *Hydnum pithyophilum*, Berk. and Curt.; resupinatum effusum, subiculo tenuissimo farinaceo-byssoideo; aculeis ochraceis compressis apice dentato-laceris. Curt. No. 1501.

Hab. On fallen branches of *Pinus palustris*, South Carolina.

Forming confluent patches several inches in length. Subiculum extremely thin, sometimes farinaceous, sometimes finely byssoid, white. Teeth ochraceous, one line long, compressed, more or less toothed or jagged at the apex.

Resembling resupinate states of *H. ochraceum*, but differing in the very scanty immarginate subiculum and compressed torn aculei. The hymenium is in fact extremely like that of resupinate portions of *Irpex sinuosus*, where the character of the genus *Irpex* is not well exhibited.

227. *H. ciliolatum*, Berk. and Curt.; resupinatum orbiculare tenue

vix a matrice solubile; aculeis brevibus compressis floccoso-ciliolatis. Curt. No. 1464.

Hab. On fallen branches. South Carolina.

Forming orbicular patches about an inch in diameter, nearly white with a pale ochraceous tint, thin, margin minutely byssoid, sometimes slightly raised. Teeth short, compressed, minutely ciliated with fine flocci extending to the very margin where they are merely little downy fascicles.

Resembling resupinate forms of *Hydnum ochraceum*, but differing widely in the nature of the teeth.

228. *Irpex mollis*, Berk. and Curt.; pileo dimidiato plano coriaceo albido tomentoso, aculeis longis compressis, apicibus subulatis vel dilatatis. Curt. No. 1729.

Hab. On trunks of trees. Santee River. Mr. Ravenel.

Pileus 2½–4 inches broad, 1½–2 inches long, flat, expanded, dimidiate, coriaceous, whitish, clothed with adpressed down, scarcely zoned; margin acute. Teeth half an inch or more long, compressed; those towards the centre mostly subulate, towards the margin much compressed, and dilated above, ochraceous.

Evidently closely allied to *I. paleaceus*, but not at all effused or reflexed but perfectly free. It is a very fine species.

229. *I. crassus*, Berk. and Curt.; suberosus crassus, dorso adnatus subimbricatus postice decurrens pileo subtiliter pubescente intus zonato; dentibus lamellosis variis apice subfimbriatis. Curt. No. 550.

Hab. High up the trunk of a living oak. North Carolina.

White, corky, beautifully zoned within, two inches thick, decurrent, subimbricate, with the pilei, which are four inches broad, slightly projecting. Surface of pilei minutely pubescent, at length smooth. Teeth lamellar, ⅓–½ an inch long, compressed, grooved, sometimes subulate, with the apices frequently fimbriated.

This curious *Irpex* differs in its thick corky pileus and zoned substance from all described species. It probably grows to a large size, as the specimens are young.

230. *Radulum Magnoliæ*, Berk. and Curt.; resupinatum effusum, insolubile, margine tomentoso; hymenio carneo-ochraceo; aculeis elongatis cylindricis obtusis. Curt. No. 1095.

Hab. On the underside of branches of *Magnolia glauca* in moist places. South Carolina.

Effused, inseparable from the matrix. Subiculum tomentose, white, extremely thin towards the margin. Hymenium smooth, ochraceous, with a reddish tinge. Teeth elongated, irregular, cylindrical, obtuse, smooth, often confluent.

Allied to *R. molare*, but thinner, and having the teeth more elongated.

231. *Phlebia orbicularis*, Berk. and Curt.; exacte orbicularis, demum confluens, vinoso-fuscus tenuis margine libero; plicis è centro rimoso-radiantibus. Curt. No. 1281.

Hab. On fallen branches of oak. South Carolina.

At first orbicular, ½–1 inch broad, at length confluent, of a rich vinous brown, thin, free at the margin, which is reflexed or involute, and obscurely tomentose. Centre often umbonate; folds superficial, slightly branched, often separated by minute fissures.

Far less gelatinous than *Phlebia merismoides*, to which it is most nearly allied, and less strongly plicate. It is a very interesting addition to a genus which contains but a few species.

232. *Grandinia tuberculata*, Berk. and Curt.; effusum inæquabile, indeterminatum; granulis majoribus ceraceis lævibus. Curt. No. 1111.

Hab. On branches of *Carya*. South Carolina.

Effused, forming elongated rugged, indeterminate patches, with no evident border. Granules large, obtuse, sometimes confluent, smooth, of a waxy consistence, ochraceous.

Intermediate between *Radulum* and *Grandinia*, having nearly the hymenium of *Radulum tomentosum*.

233. *Odontia albo-miniata*, Berk. and Curt.; effusum resupinatum; subiculo tenuissimo albo; aculeis brevibus apice palmatis fimbriatis miniatis. Curt. No. 1543.

Hab. On very much decayed oak branches. Santee River. Mr. Ravenel.

Effused, resupinate, following all the inequalities of the wood. Mycelium white, very thin and delicate. Teeth short, vermilion, compressed, palmate above, cut and fimbriated, clothed with short scattered flocci.

An exquisite fungus, very distinct in habit, and closely allied to no described species. Its very different aculei at once separate it from *Hydnum cinnabarinum*.

234. *Kneiffia candidissima*, Berk. and Curt.; immarginata crustacea nivea granulis minutis apiculatis. Curt. No. 1791.

Hab. On branches of *Juniperus Virginiana*. South Carolina. Mr. Ravenel.

Forming small snow-white crust-like patches without any distinct border, densely sprinkled with minute sharp-pointed granules.

Evidently distinguished from *Kneiffia setigera* by its persistent snow-white tint, like that of *Corticium acerinum*, which it at first sight somewhat resembles.

235. *Thelephora Pteruloides*, Berk. and Curt.; pallida; stipite compresso hymenio undique tecto sursum diviso, ramis paucis; ramulis subulatis fastigiatis sterilibus. Curt. No. 1745.

Hab. On the ground. South Carolina.

About 1 inch high, cream coloured, stem compressed, smooth, clothed with the hymenium, as are the few branches into which it is divided above; ramuli numerous, subulate, fastigiate, barren.

This species has very much the habit of a *Pterula*. It is allied to *Thelephora pallida*, but is quite distinct.

236. *Stereum calyculus*, Berk. and Curt.; pusillum; pileo cyathiformi subtiliter tomentoso opaco umbrino; stipite gracili concolore; hymenio albido obsolete venoso. Curt. No. 1716.

Hab. In damp shady woods. August. Santee River. Mr. Ravenel.

Pileus cup-shaped, $\frac{1}{3}$ of an inch broad, extremely thin, umber, opake, minutely tomentose. Stem $\frac{1}{2}$ an inch high, $\frac{1}{3}$ of a line thick, umber. Hymenium whitish, very obscurely venose.

Allied to *Stereum curtum*, Fr., and *S. pusillum*, Berk., but especially to the latter, and distinguished by its very regular pileus, which is not at all shining, or apparently zoned.

237. *Stereum subpileatum*, Berk. and Curt.; resupinatum effusum crassum suberosum a matrice solubile, hymenio ligneo-pallido; supra sulcato-zonato fulvo velutino. Curt. No. 1007. Lea, No. 233.

Hab. On dead trunks. Ohio, Mr. Lea. South Carolina, Mr. Curtis. Santee River, Mr. Ravenel.

Resupinate, spreading several inches on dead trunks, extremely hard. Hymenium smooth, pale, wood-coloured, or nearly white. Upper surface, where it separates from the matrix, tawny brown, grooved and zoned, velvety.

Closely allied to *S. rugosum*, but after much consideration we are inclined to consider it distinct.

238. *Corticium Léveillianum*, Berk. and Curt.; effusum resupinatum

molle crassiusculum carneum; margine demum libero. Curt. No. 1220. 92.

HAB. On fallen branches of *Carya* and *Cercis Canadensis.* North and South Carolina.

At first forming little peltate orbicular spots, which as they dilate, become closely attached to the matrix, with the exception of the margin, which is often free, soon confluent, soft, rather thick; of the colour of raspberries and cream. Hymenium often minutely pitted. Old specimens lose in great measure their ruddy hue, and are of a dead white.

A very pretty species, of which a specimen from Central America was communicated by Dr. Léveillé, in honour of whom it has been named.

239. *Guepinia elegans*, Berk. and Curt.; pileo late spathulato tenuissimo fulvo velutino; stipite concolori subcylindrico hirtello; hymenio succineo-fusco lævi. Curt. No. 1024.

HAB. On decaying logs. Santee River. Mr. Ravenel.

Pileus $\frac{1}{3}$–$\frac{1}{2}$ an inch broad, broadly spathulate, or even flabelliform, sometimes lobed, velvety, tawny brown, obscurely ciliated, very thin. Stem subcylindrical, $\frac{1}{3}$ of an inch high, $\frac{1}{2}$ a line thick, tawny, clothed with rather coarser down than that of the pileus. Hymenium yellow-brown, even, at first obliquely subcupulæform.

This exquisite production has somewhat the habit of *Guepinia Helvelloides*, but differs in size, colour, and other points. It is one of the most interesting contributions to American Fungi.

240. *Coryne gyrocephala*, Berk. and Curt.; stipite crassiusculo albido; capitulo ex albido-carneo fusco cerebriformi. Curt. No. 1191.

HAB. On decaying logs in swamps. South Carolina.

Gregarious, sometimes fasciculate, not rooting. Stem $\frac{1}{4}$ of an inch high, dilated above, pubescent, dirty white; head convex, at first flesh coloured, then brownish, much waved and plaited. Filaments of hymenium often forked at the apex.

Resembling in habit *Ditiola radicata*, but having the characters of *Coryne.* Unfortunately all the spores seem to have been washed off.

Descriptions of some new Genera and Species of Plants, collected in the Island of Hong-Kong by Capt. J. G. Champion, 95th Regt.; *by the late* George Gardner, Esq., F.L.S., Superintendent of the Royal Botanic Gardens, Ceylon.

[It is a melancholy yet grateful task to be permitted to edit the last MS. prepared by Mr. Gardner for the Journal of Botany, and which was received by the editor almost at the same moment with the unexpected announcement of his death. It will serve as an additional testimony to the loss which Science has sustained by his being thus called away from the scene of his labours.]—W. J. H.

During a residence of several years in Ceylon, Capt. Champion took a deep interest in its vegetable productions; and I am indebted to him for valuable contributions to my Herbarium from the southern portions, in particular, of the island. Having early in 1847 removed with his regiment to Hong-Kong, he immediately began the investigation of its Flora, with what success the present paper will show. At two different times I received small collections from him, chiefly consisting of what he considered either new or little known plants, and being himself necessarily without either a working botanical library, or a general Herbarium for reference, I have undertaken, at his request, to determine his collections for him, and to describe such species as I may consider to be either new or not sufficiently well described.

He describes the island as being much richer in vegetation than had hitherto been generally supposed; and as several of the wooded valleys and ravines have not yet been visited by him, it is very probable that many interesting species may yet reward his researches.

Of the three new genera which I have established from his collections, one, belonging to the Natural Order *Hamamelidaceæ*, is perhaps the most remarkable; and, in determining its characters and affinities, I have been led to undertake a review of the whole order, so far as my materials at hand would permit; and the result is that I have been induced to refer to it no less than three natural orders, which hitherto have been considered very distinct families. My reasons for doing this are fully stated under the article referred to; but whether they may meet the approbation of those best able to judge, of course remains to be seen. For some years Orders have been multiplied to an extent far beyond

what, I believe, will ultimately be considered judicious; but I think it is perceptible that the labours of modern botanists are tending in the opposite direction. Yet the former course has had a most beneficial effect, in so far as it has led to minute investigations into the structural differences which exist in nearly allied forms.

Perhaps in one or two instances the new species which I have established, may be found to have been done so on too slight grounds; but, if such be the case, it has arisen less from a desire to multiply species, than from the want of specimens for comparison; and every one knows how difficult it often is to determine species from descriptions alone. In such doubtful cases my reasons are always fully given for the course I have taken.

Ranunculaceæ.

1. Clematis *parviloba*, Gardn. et Champ.; caule scandente, ramis angulatis villosis, foliis ternatim biternatimve sectis, segmentis ovato-lanceolatis acuminatis integerrimis trinerviis utrinque sparse adpresse-villosis, pedunculis axillaribus folium subæquantibus trifido-subpaniculatis, caudibus plumosis.

Hab. Towards West-Point, Hong-Kong. Flowers in spring.

Folia longe petiolata, petiolis semiteretibus supra canaliculatis villosis, *inferiora* ternatim-secta, segmentis petiolatis, $1\frac{1}{2}$ poll. longa, 4–8 lin. lata, lateralibus integris; mediis profundè trifidis vel trifoliatis; *superiora* biternatim-secta, 10 lin. longa, 3 lin. lata. *Pedunculi* axillares, inferiores subpaniculato-trifidi, superiores simplices terni uniflori; bracteæ lanceolatæ, acutæ, foliaceæ, petiolatæ, sub origine ramorum et paulo infra medium pedicellorum. *Sepala* 4, lineari-lanceolata, acuminata, 7-nervia, patentia, extus villosa, 10 lin. longa, 3 lin. lata. *Stamina* plurima. *Ovaria* 12 circiter, villosa, desinentia in caudam barbatam.

Apparently near C. *acuminata*, DC., but in the nature of the foliage it is more allied to C. *Javana*, DC. In the axils of the bracteoles there are what appear to be the rudiments of flowers, which, if ever developed, would give a more paniculate form to the peduncules than they have in my specimens.

Capparidaceæ.

1. Capparis (*Eucapparis*) *membranacea*, Gardn. et Champ.; stipulis nullis, foliis oblongo-lanceolatis acuminatis basi rotundatis glabris membranaceis reticulatis subtus nitidis, pedicellis supra-axillaribus 3–4

seriatis approximatis petiolo triplo fere longioribus, sepalis margine sublanuginosis, ovariis glabris.

HAB. Mount Victoria, Hong-Kong.

Frutex sarmentosus, glaberrimus. *Rami* teretes, tenuissimè striati. *Folia* 4–5 poll. longa, 15–18 lin. lata. *Petioli* 3 lin. longi. *Pedicelli* 8 lin. longi. *Sepala* ovato-rotundata, 3½ lin. longa. *Petala* lineari-oblonga, obtusa, 5 lin. longa. *Stamina* 20 circiter, longe exserta.

This species belongs to the same section as C. *Ceylanica* and C. *horrida*, and will range along with C. *quiniflora*, DC.

POLYGALACEÆ.

1. Polygala (*Blepharidium*) *Lourerii*, Gardn. et Champ.; caule à basi subramoso suffruticoso erecto, ramis teretibus pubescentibus, foliis ovato-lanceolatis vel oblongis acutis apiculatis basi obtusis supra glabris reticulatis subtus puberulis breviter petiolatis, racemis lateralibus et terminalibus multifloris folio longioribus pubescentibus, bracteolis linearibus decidius, alis ovatis obtusis glabris capsulâ orbiculatâ latè alatâ emarginatâ glabrâ paulò longioribus.

Polygala *Sibirica, var. β. Lour. Flora Cochin. Ed. Willd. p.* 517.

HAB. Mount Victoria, Hong-Kong.

Suffrutex semipedalis et ultra. *Folia* 15 lin. longa, 6 lin. lata, supra viridia valde reticulata, subtus pallida, margine subrevoluta. *Calycis* sepala 2 exteriora oblonga, obtusa, glabra, margine ciliata. "*Corolla* albicans, ad viridem declinans." (Lour.) *Carina* cristata. *Capsula* suborbiculata, 3 lin. lata. *Caruncula* seminis pilosi brevior.

That this is the P. *Sibirica, var. β.* of Lourero, there can be no doubt, though I cannot find that it has been taken up by any succeeding writer on Chinese botany. In habit it accords very much with specimens of the true Pol. *Sibirica* which I possess from the Herbarium of Pallas, but is more woody at the base, has larger leaves, broader and more obtuse sepals, a larger carina, and a broadly winged, not a simply margined, capsule. It is more nearly allied to P. *Javana*, DC., from which it is distinguished by the shape of its leaves, and the broadly winged glabrous capsule. De Candolle refers P. *vulgaris* of Thunberg's Flora Japonica to P. *Sibirica*, perhaps correctly, at all events Thunberg's phrase, "foliis lineari-lanceolatis," separates it from the present plant.

TILIACEÆ.

1. Friesia *Chinensis*, Gardn. et Champ.; dioica: foliis alternis longè petiolatis oblongo-lanceolatis vel oblongis acuminatis basi acutis serrato-dentatis, serraturis incurvo-apiculatis, subtus resinoso-punctatis, racemis simplicibus lateralibus 6–12-floris pedicellis calycibusque pubescenti-hirtis, stigmate 3-lobo.

HAB. Hong-Kong.

PLANTA MASC.—*Folia* 3–4 poll. longa, 9–12 lin. lata, reticulato-venosa. *Stipulæ* deciduæ, 1½ lin. longæ. *Flores* in racemos erecto-patentes dispositi. *Calyx* profunde 4-partitus, foliolis lineari-oblongis acutis extus pubescenti-hirtis, 2 lin. longis. *Petala* 4, cuneata, apice obtusè 3–5-dentata, utrinque puberula, albida, calyce vix longiora. *Discus* glandulosus, hirtus. *Stamina* 7. *Filamenta* brevissima. *Antheræ* erectæ, tetragonæ, muticæ, puberulæ, biloculares, apice rima transversa bivalves. *Ovaria* abortiva. *Stylus* parvus, apice obscurè 3-lobus.

This plant agrees with *Friesia* in its diœcious character, tetramerous flowers, lobed, not laciniated, petals, and lobed stigma. It has, however, the anthers of *Elæocarpus*. The female flowers and fruit I have not seen.

2. Heptaca? *latifolia*, Gardn. et Champ.; foliis latè ovatis vel subrotundatis acutis vel subacuminatis basi rotundatis vel subcordatis margine minutè denticulatis supra glabris subtus stellato-tomentosis, cymis axillaribus folio brevioribus multifloris, floribus compactis, petalis 5.

HAB. Hong-Kong. Flowers in June.

MALE.—*Branches* subflexuose, round, covered with a smooth pale green back, which is thickly studded with small oblong purplish spots. *Leaves* alternate, petiolate, membranaceous, from broadly ovate to suborbicular, acute, or shortly acuminate, rounded or subcordate at the base, minutely denticulate, dark green and glabrous on the upper surface, ash-coloured, and densely covered with stellate pubescence on the under, penniveined, the veins erecto-patent, with numerous simple or branched veins connecting them, the interstices finely reticulated, all the veins prominent on the under surface only, length, exclusive of the petiole, 2½–3 inches, breadth 24–28 lines. *Petiole* 9 lines long, reflexed, and then curved upwards, semiterete, channelled on the upper surface, puberulous, but at length glabrous. *Stipules* none. *Peduncles* axillary, terete, puberulous, shorter than the leaves, cymose at the apex, the

branches of the cyme densely covered with fine brownish tomentum. *Flowers* numerous, compact, pedicellate. *Pedicels* terete, about 3 lines long, with a single minute bract at the base. *Calyx*, in the bud state, with the divisions valvately connate, at length deeply divided into 4–5 ovate-oblong, obtuse, segments, about 2 lines long. *Petals* 5, obovate-oblong, obtuse, 3½ lines long. *Æstivation* imbricated. *Hypogynous disk* none. *Stamens* about 80, inserted on the receptacle. *Filaments* free, filiform, glabrous, shorter than the petals. *Anthers* ovate, didymous, 2-celled, the cells opening longitudinally. *Abortive ovary* very small, densely covered with long brown articulated hairs, and terminated by a short, many-cleft style.

Of this curious shrub I have not had an opportunity of examining either the female flowers or the fruit; indeed, Capt. Champion remarks that though it is common in Hong-Kong, he has never met with other than male plants. That it belongs to *Tiliaceæ*, I think there can be no doubt, though in the absence of further knowledge of its structure, it is difficult to say whether it can be referred to any known genus of that family, or if it forms the type of a new one. With *Brownlowia* of Roxburgh, it has many points in common, both in habit and in the structure of the male flowers, but the stamens are inserted directly on the receptacle, and there is no inner row of petaloid ones. The genus *Heptaca* of Lourero, which in the latest systematic works still remains among the "Plantæ incertæ sedis," strikes me as being the one to which the present plant has the nearest relationship, and to it, therefore, I provisionally refer it. In habit they both perfectly agree, and the only difference in the male flowers, is, that in *Heptaca* there are ten petals, while here there are only five. Imperfect as the above description of the plant is, it may direct the further attention of botanists to it, and also as to whether I am correct in referring *Heptaca* to *Tiliaceæ*. Lourero distinctly states that his *Heptaca Africana* is a native of the west coast of Africa: why Endlicher asserts that it is a native of Cochin-China I know not.

TERNSTRŒMIACEÆ.

Pentaphylax, *Gardn. et Champ.*

Char. Gen. *Calyx* persistens, bibracteolatus, pentaphyllus, foliolis imbricatis, ovatis, obtusis, inæqualibus. *Corollæ* petala 5, hypogyna,

basi libera, obovato-oblonga, calycis foliolis alterna. *Stamina* 5, hypogyna, libera. *Filamenta* crassa, complanata, infra medium dilatata. *Antheræ* introrsæ, biloculares, basi insertæ, loculis discretis, ovatis, compressis, poro apice dehiscentibus. *Ovarium* liberum, quinqueloculare. *Ovula* in loculis gemina, collateralia, angulo centrali inserta, pendula. *Stylus* filiformis, apice quinquefidus. *Capsula* ovata, quinquangularis, loculicidè quinquevalvis valvis lignosis, medio septiferis. *Semina* in loculis gemina, collateralia, pendula, superne in alam membranaceam, oblongam, obtusam producta. *Embryo* ignotus.—Arbuscula *Chinensis* foliis *alternis, petiolatis, ovato-oblongis, acuminatis, integerrimis, penniveniis*, floribus *parvis, albis, pedicellatis, infra folia hornotina ortis, igitur in pseudo-racemos dispositis.*

1. Pentaphylax *euryoides*, Gardn. et Champ.

HAB. Hong-Kong.

DESCR. *Arbuscula* valdè ramosa. *Rami* teretes, cortice cinereo vestiti. *Ramuli* angulosi, puberuli. *Folia* alterna, petiolata, ovata, vel ovato-oblonga, acuminata, basi obtusa, integerrima, glabra, pennivenia, 2½ poll. longa, 10–15 lin. lata. *Stipulæ* nullæ. *Flores* hermaphroditi, infra folia hornotina in pseudo-racemos dispositi, parvi, albi, 2-lin. longi, pedicellati. *Pedicelli* 1½ lin. longi, basi unibracteati, bracteis parvis, deciduis, apice bibracteolati, bracteolis late ovatis, apiculatis, ciliatis, calycem stipantibus. *Calyx* persistens, pentaphyllus, foliolis imbricatis, ovatis, obtusis, inæqualibus, glabris, margine ciliatis. *Petala* 5, hypogyna, libera, obovato-oblonga, apice obscurè dentata, calycis foliolis alterna, per æstivationem imbricata. *Stamina* 5, hypogyna, libera; *filamenta* crassa, complanata, infra medium dilatata. *Antheræ* introrsæ, basi affixæ, biloculares, loculis discretis, ovatis subcompressis, per æstivationem pendulis, demum erectis, poro apice dehiscentibus. *Ovarium* liberum, 5-loculare. *Ovula* in loculis gemina, collateralia, anguli centralo inserta, pendula. *Stylus* filiformis, apice 5-fidus. *Capsula* ovata, quinquangularis 3 lin. longa, loculicide 5-valvis, valvis lignosis, medio septiferis. *Semina* in loculis gemina, collateralia, pendula, superne in alam membranaceam, oblongam, obtusam producta. *Embryo* ignotus.

Though an undoubted member of the order *Ternströmiaceæ*, this plant cannot be referred to any of the tribes into which it is at present divided, having almost equal claims to several of them. Thus it has

the habit and mode of inflorescence of *Eurya*, the anthers of *Saurauja*, and the capsules and seeds of *Gordonia*. It ought, perhaps, to form a distinct tribe, distinguished by its definite stamens, and geminate, collateral, pendulous ovules. In the mean time it may be referred to *Gordonieæ*, the structure having the greatest tendency in that direction. The nature of the embryo I have not been able to ascertain, in consequence of all the capsules on my specimens being either much too old, and the seeds gone, or too young, and the buds not in a fit state to examine.

2. Schima *superba*, Gardn. et Champ.; ramis teretibus verrucosis glabris, ramulis pilosiusculis, foliis ovato-ellipticis acuminatis supra medium serrato-crenatis glabris, petiolis alatis puberulis, pedunculis ad extremitatem ramulorum axillaribus solitariis unifloris petiolum subæquantibus, sepalis rotundatis glabris sericeo-ciliatis.

HAB. Wingnychery valley, Hong-Kong.

Arbor pulcherrima. *Folia* alterna, coriacea, penninervia, obscurè reticulata, 4–5 poll. longa, 1½-2 poll. lata: petiolis 9–12 lin. longis. *Pedunculi* teretes, glabri, 8–10 lin. longi, ad apicem incrassati, bibracteolati, bracteolis deciduis. *Calyx* pentasepalus, persistens, æstivatione imbricata, sepalis æqualibus, erecto-incurvis, rotundatis, glabris, margine longe sericeo-ciliatis, 2 lin. latis. *Petala* 5, alba, obovata, obtusa, basi cohærentia et ibi extus sericea, inæqualia, majora pollicem longa, unum cætera ante explicationem calyptratim tegens. *Stamina* numerosa, pluriserialia; *filamenta* complanata, inter se et cum petalis connata; *antheræ* basi affixæ, tetragonæ, lateraliter et longitudinaliter dehiscentes. *Ovarium* depresso-conicum, basi dense sericeo-pilosum, 5-loculare; *ovula* in singulo loculo 3, collateralia, pendula. *Stylus* 5-sulcatus, versus apicem incrassato-clavatus; *stigma* 5-lobum.

This is stated by Capt. Champion to be a most magnificent tree when in blossom. The habit is quite that of *Gordonia*, from which the genus differs essentially in the cucullate outer petal, and the inner half of the dissepiments of the capsule remaining attached to the central column.

(To be Continued.)

BOTANICAL INFORMATION.

Botany of Western Australia; by Mr. James Drummond.

The following communication, giving some most striking discoveries by our indefatigable fellow-colonist Mr. James Drummond, in his botanical researches to the south, is addressed to Mr. G. Leake :—

Dear Sir,—In my last letter I promised to send you some observations on the botany of this part of the colony. I have now collected three hundred species, principally on the Perongarup and Toolbranup hills, and in the vicinity of Cape Riche. I shall confine my observations to such plants as are remarkable for beauty, or otherwise interesting. To the *Leguminosæ*, the most numerous order in Australia, I have made many additions. One of the most beautiful plants I have seen is, I suppose, a species of *Gastrolobium*, which I call *G. Leakeanum*: it grows twelve to fifteen feet high, with opposite leaves three inches long by two broad, and bears clusters of large deep scarlet flowers in the axils of the leaves; it is abundant on Congineerup, near the east end of the mountain, growing in all sorts of soil, from the base to the summit. The banks of the Salt River and its tributary streams produce a fine species of *Brachysema*, allied to the *B. latifolia* of Mr. Brown, but with larger leaves, which have longer points; it is an upright growing plant, producing its flowers on the shoots of the preceding season; they are borne on short footstalks, five or six in the axils of each leaf; they are large and bright scarlet. The fine foliage of this plant, silvery underneath, and the great number of its flowers, in which it differs greatly from the other species of the genus, make it one of the finest plants of the order to which it belongs.

I found on Congineerup a remarkable Leguminous shrub, bearing, instead of leaves, large glaucous *phyllodia*, somewhat resembling *Acacia gamophylla*, but having yellow papilionaceous flowers: I could see nothing of the old or young seed vessels. The plant is very rare on Congineerup, near the east end of the mountain. To *Myrtaceæ*, and particularly to the sub-order *Chamelauciæ*, I have made most important additions. A beautiful and apparently nondescript genus near *Actinodium*, but differing from it in having the outer flowers of the heads forming a ray like many composite plants. I gathered two species of

of the genus in my last journey to the south, both fine plants, but the one now found much surpasses the others; it grows on an upright shrub, from two to three feet high, with small imbricated, heath-like leaves; the heads of the flowers are borne in corymbs from a foot to eighteen inches in diameter, each head of flowers, including the ray, about two inches wide. There is a curious resemblance between these heads of flowers and a fine double daisy (*Bellis perennis*); the colour varies from white to various shades of rose colour. Several fine species of *Chamelaucium* have been found, one with flowers as large as *Verticordia insignis;* the flowers are white when they first come out, but before they go off they change to a fine purple. There seems scarcely any generic difference between *Verticordia* and *Chamelaucium.*

To the now splendid genus *Genetyllis* I have added four additional species. The tulip-bearing *Genetyllis*, discovered and described in my last journey, I gathered in flower on Mongerup: I had only seen it when the seeds were ripe, and although it was then beautiful, it now surpasses my former description. Along with it, on Mongerup, I found a species with heath-like leaves, a bright scarlet involucre inclosing dark purple flowers. On Congineerup I found two large-bracted species of this genus; one with thyme-like, ciliated leaves, and the bracts which form the involucre ciliated; the other with heath-like leaves and bracts, without ciliæ; the bracts in both are rose-coloured. In my first ascent to Toolbranup, I found a scarlet Fuschia-like *Genetyllis* (noticed in my journal), but saw only a few specimens, which I lost on the mountain. It was burned over last year by the natives, and where the *Genetyllis* and other rare plants grew there is nothing to be seen but stones and blackened stumps. I have now, on Hume's Peak, gathered a beautiful scarlet Fuschia-like *Genetyllis*, which may possibly be the same species. When we consider that the involucres of these plants resemble corollas of the same size, it will be seen that they are highly ornamental before the flowers expand, and they retain their beauty in a great degree until the seeds are ripe. Their fragrance is at least equal to the *Hedaroma latifolia* of Lindley, which is *Genetyllis citriodora* of Endlicher; they are most desirable plants to introduce into cultivation. Two fine species of *Calythrix* have been found; one of the largest yet seen of the genus bears rose-coloured flowers, which become white before they go off; and one with reddish purple flowers—a fine plant. To the true *Myrtaceæ*

many plants have been added. A *Hypocalymma* grows on Congineerup, in the woods at the east end of the mountain, a faithful drawing of which, leaves, flowers, and branches, might very well pass for the broad-leaved Italian myrtle. There is also a beautiful purple species of the *Cardiomyrtus*-section of this genus, which I observed on all the Toolbranup hills. To *Rutaceæ*, especially to the genus *Boronia*, I have added several beautiful plants. In the swamps behind Cheyne's Beach I observed a pinnate-leaved, black-flowered *Boronia*—a remarkable plant; it grows four or five feet, with drooping branches; the corollas are yellow inside, but the yellow is not seen unless the branches are turned up; the flowers appear quite black; the anthers are smaller, and, I think, fewer in number than is usual in *Boronia*, and concealed by the projecting umbrella-like stigma; the plant has but little of the diosmaceous scent of *Boronia*, and the flowers are very fragrant in the night-time. A pinnate-leaved *Boronia*, with yellow flowers inside and out, and all the usual characters of the genus, is seen on the side of the path from Cape Riche to K. G. Sound; a fine pinnate-leaved species with large rose-coloured flowers, grows on most of the Toolbranup hills; and one with trifid, very minute leaves; together with a very small entire-leaved species, perhaps the *B. tenuifolia* of of the Plantæ Preissianæ, grows with it. The beautiful blue-flowered *Eriostemon nodiflorum*, found here, is a different species from our Swan River *E. nodiflorum*, which has white flowers, more or less tinged with rose colour, and a different habit; it grows also in a very different situation, in the beds of stony brooks. The beautiful rose-coloured, sweet-scented *Hibiscus* of Cape Riche, is a very different plant from *H. Hugelii*; and is quite distinct from *H. Pinonianus*, which grows with it, and bears purple flowers. I found a pretty white-flowering diœcious malvaceous plant, remarkable for having the male flowers much larger than the female; the plant is very rare on the right bank of the Salt River, just by the second crossing-place from Cape Riche to the sandal-wood stations. In regard to *Epacrideæ*, I have added many species of a new genus to this order; I found two on Congineerup. The plants are of robust habit, and bear their flowers in the cone-like terminations of the branches; these all become white at the time of flowering, with the exception of the points of the leaves, in the axils of which the flowers are borne: these retain their green colour. From this colouring of the cones at the time of flowering, these plants are showy, as well as

curious. I found a red-flowering *Andersonia* on Mongerup; it is the only red flower I have seen of the genus. I have added many composite plants to my collection. Soon after the rains set in, a beautiful little annual everlasting flower covers the tops of the Perongarup hills, in many places giving them the appearance of being covered with snow. This little plant would be worth cultivating in England, and it would flower long before any of the other sorts from seed. I found a very curious plant of this order, of a genus different from any other I have before seen in this country, and bearing, in leaves and flowers, a considerable resemblance to the European Dandelion; it has a single, milky, tuberous root, the size and shape of a skirret; one is annually formed, which flowers the following year, and, like some of the *Orchideæ*, the tuber which flowered the year before, is seen, in an exhausted state, by its side. I have made some additions to my collection of *Proteaceæ*. A large and showy species of *Isopogon* grows on the tops of all the Toolbranup hills; I suppose it is altogether a larger plant than the *L. latifolius* of Mr. Brown. A remarkable *Isopogon*—a stemless species, with downy leaves, a foot long, divided as in *Franklandia fucifolia*—grows about the lakes to the east of Toolbranup; and a fine upright-growing thorny *Adenanthos* on the top of low ironstone hills in the same vicinity. In botanical characters, it comes near the *A. pungens* of the Plantæ Preissianæ; but that is a prostrate plant, covering the ground like a carpet, while this has no branches near the ground. A very curious *Grevillea*, with smooth, rigid, simply pinnate leaves, is seen in several places by the road-side in going from Cape Riche to the sandal-wood stations. I must leave some account of the *Endogens* I have met with to a future opportunity.

In this journey I have made some observations on the influence the earth—I mean the particular sort of soil—has on the plants which clothe its surface. It is well known that plants vary according to latitude, longitude, and altitude; but the difference caused by all these in the extent of a few hundred miles, is not one-tenth part so great as that caused by the different nature of the soil, sometimes within the distance of one mile of the earth's surface. I shall give a few striking examples:—The Perongarup hills lie at the distance of twenty-five miles to the N.E. of K.G. Sound, the Toolbranup hills, about twenty miles farther in the same direction; they are clusters of hills or groups, both surrounded by what is called in this colony ironstone gravel—a

sort of indurated clay, coloured from ironstone, of a very barren description. It is, therefore, evident that the extraordinary difference of the plants which clothe the surface of these hills must in a great measure be caused by the different nature of the rocks and soil of which they are composed. The Perongarup are clothed with mosses and *Jungermannia* and lichens, as rank and luxuriant as I have ever seen them in the moist, rich valleys in the south of Ireland. These, as they grow and decay, lay the foundation of a soil which is covered with grasses and sowthistles equally rank to the tops of the hills; these, in their turn, furnish a soil which is covered with gigantic gum-trees, many of them 100 feet high, without a branch—by far the finest timber I have seen in any country. On the Toolbranup hills, from the porous nature of the sandstone rock, and the shifting, exfoliating nature of the slate, there is not a moss to be seen: there is therefore no soil formed for grasses to grow on. Over the whole of the sandstone part there is not a tree to be seen, and on the slate there are but a few stunted ones, in valleys near their base, and in gullies for a little way up their sides. Another striking example of the effects the soil has on the plants which clothe its surface, is to be seen at Cape Riche: the Cape itself is granite, and on it a soil is formed which produces almost all the grasses and other plants found in the best districts of the colony, with several others which are found only on the sea-coast. Mr. Cheyne's residence, on the east side of the cape, is on limestone, and near it he has most of the plants which grow on calcareous soil in this colony. But the most striking example of the effects of the soil on the plants which grow upon it, is seen at Mount Melville, a low ironstone hill about half a mile from Mr. Cheyne's residence. This hill is the "Collis Konkoberup" of the Plantæ Preissianæ. To the many new plants found on this hill by Mr. Preiss, I have added many more. Here there is no difference of altitude, or difference of moisture; and it is very evident that the extraordinary variety of the plants which grow on Mount Melville and Cape Riche is solely owing to the different nature of the rocks which form these heights.

Cape Riche, October 29th, 1848.

Note on the genus Thelesperma *of* Lessing, *by* ASA GRAY, M. D.

In examining the Compositæ of the Herbarium formed by the U. S. Exploring Expedition under Captain Wilkes, I noticed among those gathered at Rio Negro, Northern Patagonia, a plant which struck me as being a close congener of the *Cosmidium gracile*, Torr. and Gray, Fl. North Am. vol. ii. p. 350; and I was pleased to find this genus represented in the region of extra-tropical South America, which so nearly corresponds to that district of North America to which belong the three species of *Cosmidium* already described. It was at once apparent, however, that this southern plant is no other than the *Bidens Megapotamica*, Spreng., and the *Thelesperma scabiosoides* of Lessing. The genus *Thelesperma* is so well characterized in De Candolle's Prodromus, that I see not how the resemblance should have been unobserved when the genus *Cosmidium* was founded; except that the latter was chiefly established on the radiate *C. filifolia*, with *neutral* rays, while *Thelesperma*, though founded on a rayless species, is placed among the *Verbesineæ*, where the rays are pistillate. With the specimens before me there can be no question that our genus *Cosmidium* must be merged in the much earlier genus of Lessing; at most, it can only be retained as a sectional name for the radiate species; as follows:—

THELESPERMA, *Less. in Linnæa, and Syn.* p. 234. *DC. Prod.* vol. v. p. 633. (Cosmidium, *Torr. and Gray, Fl. N. Am.*, vol. ii. p. 350.)

§ 1. THELESPERMA vera, *Less.* — Capitulum homogamum discoideum.

T. *scabiosoides*, Less. l. c. Hook. et Arn. Journ. Bot. vol. iii. p. 319. Bidens Megapotamica, *Spreng. Syst.* vol. iii. p. 424. Southern Brazil and North Patagonia.

T. *gracile*, — Bidens gracilis, *Torr. in Ann. Lyc. New York*, vol. ii. p. 215. Cosmidium gracile, *Torr. and Gray, l. c. Gray, Pl. Fendl.* p. 86. Upper Arkansas to New Mexico.

§ 2. COSMIDIUM.—Capitulum sæpius 8-radiatum, ligulis neutris.

T. *simplicifolia*,—Cosmidium simplicifolium, *Gray, Pl. Fendl.* p. 86. Northern Mexico.

T. *filifolium*,—Coreopsis filifolia, *Hook. Bot. Mag.* t. 3505. *DC. Prod.* vol. v. p. 290. Cosmidium filifolium, *Torr. and Gray, l. c.* Plains of Arkansas and Texas.

NOTICES OF BOOKS.

Nanna oder über das Seelenleben Pflanzen, von GUSTAV THEODOR FECHNER (*Nanna, or on the Soul-life of Plants*). Leipzig, 1848. 8vo.

We will confine ourselves in our notice of this little volume to a translation of the few remarks on it in Botanische Zeitung for 26th January last (no. 4) to the *resumé* which is there given, and to one or two other extracts, leaving it to our reader to form his own judgment whether or not to consult the book itself.

"This is an attractive book for all who delight in plants and flowers, its aim being to demonstrate that the vegetable kingdom is endowed with a soul, though, of course, of its own kind. Even those who cannot arrive at the same conclusions with its ingenious and clever author, will not regret perusing the book, and may, perhaps, be reminded of some notions of their own not altogether different from those here propounded. The title *Nanna*, has reference to the wife of Baldur, the blossom, or the empire of flowers. The contents are comprised in 18 sections, of which we here give the 17th, containing the *resumé*."

"1. The primeval opinion of mankind concerning nature, and the characteristic and æsthetic impressions which plants make on us, plead much louder in favour of their having a soul, than the predominant popular view speaks against its existence.

"2. Although plants are more unlike us than animals are, they nevertheless agree with us and them, as to the principal features of life, in such a wise, that, granting that their animation must be different from ours, yet are we not warranted to adopt in their case, the fundamental difference between animation and non-animation. Generally, there exists that relative completeness in both creations, that the soul-life of plants supplies those very blanks, which are left in that of man and brutes.

"3. The circumstance that plants want the nerves and similar organs of sensation which belong to animals, proves nothing against their having perception; because, on the other hand, they are capable of performing certain functions, in a modified form, for which animals require nerves and peculiar organs, without the presence of any such organs. And, generally, the assertion that any particular form of

animal nerves and organs of sense, is indispensably required to cause sensation, is unsupported by facts.

"4. The teleological consideration of nature becomes more satisfactory when we attribute a soul to plants, than by denying it; because a great number of arrangements and relative proportions in nature acquire thereby a signification of life and importance, which would otherwise appear to us as dead and inert, or as empty playthings.

"5. That the vegetable kingdom is subservient to the wants of man and other animals, proves nothing against its being at the same time conducive to its own benefit: for we observe, that reciprocity of uses is not incompatible with the design of nature, and plants have as much to serve the wants of animals as the reverse.

"6. If it should appear to us that the condition of plants would be miserable, considered as animated beings, in consequence of their inability to resist injuries from man or animals, it is simply because we look at the theory in a human point of view. Quite otherwise will be our impression if we contemplate vegetable life according to its own peculiar character. We are, in fact, apt to attribute undeserved weight to this objection.

"7. If it is contended that plants can have no soul, since they want freedom of action and spontaneous motion, we lose sight of the proofs which demonstrate, that plants do possess free will in the same sense as animals, or else we require of the former a something, which does not exist among the latter; because, after all, the question of real free will among animals is hardly admissible.

"8. Since the two kingdoms approach each other by an intermediate kingdom, in which the difference of either becomes obscure, and which consists of the most imperfect beings of both, we are not authorized to consider the vegetable kingdom as absolutely subordinate; especially as it rises from the said intermediate kingdom in its more perfect members. This consideration, as well as the circumstance that both kingdoms have the same date of creation, proves that neither of them can be subordinate, as far as regards animation.

"9. If it is pretended, that the signs of centralization, of connecting individuality, or of a consistent balance in the organization of plants are wanting, as the condition or expression of unity or individuality of a soul, we are either mistaking the right point of view, or we require that in plants, which is not found in animals.

"10. It is probable that the soul-life of plants is much more purely sensual than that of animals. Although animals want the reasoning faculty and the consciousness of self, they have, nevertheless, some recollection of the past, and presentiment of the future. But the vegetable life probably exists exclusively in the present, participating at the same time in the universal animation; and instead of being less perfect, it may be, that the sensation in plants is more developed than in animals."

The author thinks that this *resumé* comprises the requisite arguments for refuting the following objections, which might be urged against his theory: namely,—"1st that plants have no nerves; nor, 2ndly, free motion; 3rdly, that they have no central organ, nor anything that would indicate a connecting soul-individuality; 4th, we see them unsparingly trodden under foot, mowed, and cut down, and, in fact, exposed mercilessly to every sort of encroachment; but it is contrary to our feeling to suppose that such could be the destination of sentient beings; 5thly, plants seem designed solely for human and animal purposes, for the service of animated nature, and cannot have any proper soul or object of their own; 6th, in those lower animals which resemble plants, there are but equivocal indications of any soul, and therefore none can exist in the real plants; and 7thly, it is impossible to conceive a condition of soul still lower than that of animals." (p. 35.)

"That the plant has not the means of attempting to escape from mischief, may seem to us very hard. But consider the case of the soldier who is doomed to stand against cannon, and to see his comrades killed man for man. How hard this! To feel the ball before it hits him, and more intensely, perhaps, than at the fatal stroke! Now, the corn knows nothing of the approach of the reaper, until at the instant it is cut down; just as is the case in regard to him, who it is the will of Providence should be removed by some sudden stroke, in the very midst of the engagements of life, and without one moment's presentiment of his death. This very unconsciousness constitutes, perhaps, one of the delightful features of the vegetable life, devoted as this is entirely to the present, and as a compensation for the higher enjoyments of animal life. Is it to be supposed for one moment that the poor mouse suffers less under the playful but murderous claws of the cat, in its hun-

dredfold anticipation of death, than would be the case were it killed by one blow of the paw? After all, what is our perpetual escape from the dangers of death that surround us, but a constant running away from the paws of the great black cat, which we know will do for us at last?"—p. 92.

"Are the phenomena of vegetable life in themselves so many proofs against any psychological signification? Why should there be only animated creatures which run, cry, and eat, and not also others that blossom, perfume the air, satiate their thirst in draughts of dew, their longings in the development of buds, and a still higher tendency in their turning towards the light of day? I can perceive no superiority in the mere act of running and crying, above the faculty of blossoming and perfuming, which should entitle a being to a soul and to sensation; or why the graceful and ornamental form of the cleanly plant should be less worthy to possess a soul, than the unsightly form of the dirty grub? Does the rain-worm look at us with more animation than the Forget-me-not? Does its obscure wallowing beneath the ground display more free will and perception, than the ceaseless striving of the plant from the earth upwards into the reign of light, its untiring expansion in all directions?"—p. 13.

Botanical Collection of the late Prince Adalbert *of Prussia.*

The collection of plants made in the Himalayas by the ill-fated Hofmeister, who accompanied Prince Adalbert of Prussia, himself also deceased at an early period of life, has been studied and arranged by Dr. Klotzsch. It comprises, besides a small collection of useful and ornamental species, which were procured in Ceylon, 440 species from the Himalayas, amongst which are 10 new genera and 145 new species. The description of this interesting collection, will, it is expected, appear very shortly.—*Bot. Zeitung*, June 22nd, 1849.

On two Balsam Trees (Balsamodendra) *from Scinde; by* J. Ellerton Stocks, M.D., F.L.S., *Assistant-Surgeon on the Bombay Establishment, Inspector of Forests in Scinde.*

(Tab. VIII. and IX.)

[Obs. There are few vegetable products that require a more careful investigation than the plants yielding the celebrated gum-resins of commerce—familiar to us under the name of *Myrrh* and the *Bdellium* or *Googul* (Moogl of the Arabians, *βδελλιον* and *μαδελκον* of Dioscorides, according to the accurate Dr. Royle's researches). We are therefore much indebted to Dr. Stocks for the account here given of the Googul or Googil of Scinde. In the MS., however, this gentleman had called the plant by the name of *Balsamodendron Roxburghii*, from an idea that it was identical with the *B. Roxburghii* of Arnott (the *Amyris Commiphora* of Roxburgh,) a native of North-eastern Bengal. A comparison of specimens of both in my Herbarium has satisfied Dr. Wallich and myself that the two species are very distinct. It is true it bears the same name among the Bengalese as the Scinde plant, but that name appears to be given to different plants yielding a somewhat analogous product; as, for example, the *Googul* or *Googil* of the Coromandel coast, which Dr. Stocks observes is the *Boswellia glabra*. But it is extremely improbable that a plant of the North-eastern frontier of Bengal should be identical with one of Scinde, where the vegetation bears a striking resemblance to that of Syria or Arabia. Dr. Roxburgh, too, observes that though his plant, when broken or bruised, diffuses a grateful fragrance, like that of the finest *myrrh*, yet that "the juice never congeals, but is carried off by evaporation, leaving little or nothing behind; and all that he could ever procure was a very minute portion of gummy matter, which certainly resembles myrrh both in smell and appearance, but has no tendency to be even tenacious or elastic." The excellent Dr. Royle, however, rather inclines to the opinion that this tree, when old, does yield a gum-resin, closely resembling myrrh, because that which he examined "was said to come from the hills, at the foot of which the tree is found." Be that as it may, it is very certain that the *Mukul* or *Googul Balsam tree* of the Persian gulf, here described by Dr. Stocks, is a very distinct species; and the gum-resin it yields is much more likely to be that of the ancient writers on the subject, for it is assuredly the genuine *Googul* of the "Bazaars of Hydrabad and Kurrachee," and that which is exported from Bombay. I have ventured to give it the

name of *Balsamodendron Mukul*, rather than of "Googul," which latter appellation is clearly given to three different plants. My only doubt has been whether I shall not refer it to *B. Myrrha* of Nees (represented in Royle's valuable "Manual of Materia Medica," p. 339, fig. 56,) from Gison, on the borders of Arabia Felix, from which shrub Ehrenberg and Hemprich collected "some very fine *Myrrh*." The flowers, indeed, were not known, but the figure is a very good representation of the fruiting state of the plant, so far as can be judged without the aid of analysis. Dr. Royle justly remarks "that the whole of the species of the genus require to be carefully examined from good and authentic specimens, accompanied by their respective products, before the several doubts can be resolved." Dr. Stocks is happily placed for carrying out such investigations, and he has fulfilled Dr. Royle's injunctions most accurately, in the present instance, both in descriptive matter and figure.

I may here add that the *Heudelotia Africana*, Guill. et Perot. Flora Senegambiæ (*Balsamodendron*, Arnott) is a species having great affinity to our *B. Stocksii*; but it differs essentially in the very long tubular calyx, and yields "*African Bdellium*," or that imported into France from Guinea and Senegal, according to Perrotet. This would appear to be the "*Niotout*" described by Adanson, (Travels in Senegal,) as yielding a kind of *Bdellium*. Of all this group of useful gum-resins (*Balsamodendra*) it may be said that this African species and the Scinde species are the only ones yet satisfactorily ascertained to the present day.]—Ed.

1. The Mukul *or* Googul Tree. (Tab. VIII.)

The gum-resin *Googul* has had its synonyms traced out by Sprengel in Hist. Rei Herbariæ I. 272, followed by Ainslie in Materia Indica I. 29, and Royle in Illustr. Botany Himal. Mount. p. 176. It is the Mukul of the Persians and Arabians, and the Bdellium (βδέλλιον) of Dioscorides and (?) Genesis ii., 12; Numbers xi. 7.

There has always been, however, some degree of uncertainty about the tree from which it is obtained.

It is unnecessary here to dwell on the idea of Kæmpfer (Amœnitates, p. 668) that it is produced by the *Borassus flabelliformis*, or of Matthiolus, that it comes from the *Chamærops humilis*. Moreover it has no connection with the Googul of the Coromandel Coast, which is the Koonder gum from the *Boswellia glabra*, Ainslie I. 136.

Virey, Hist. Nat. des Médicamens, p. 291, first suggested that Bdellium came from an *Amyris*, the *Niotoutt* of Adanson, Voy. 162, *Heudelotia Africana*, of Flora Senegambiæ 1. 150, *Balsamodendron Africanum*, Arnott in Annals Nat. Hist. 3. 87. It is probable, indeed, that African *Bdellium* is yielded by this shrub, which is closely allied to the *Googul* tree of Sylhet and Assam, which Dr. Roxburgh had growing in the Calcutta Garden, and described in the Flora Indica 2. 244, under the name of *Amyris Commiphora*, with the Sanscrit synonym of *Googula*; but he was not aware of its yielding a bazaar-gum. In the Hortus Bengalensis this same plant appears as the *Amyris Agallocha*, which was probably the name finally adopted by Roxburgh, from some suspicion of the distinctness of Jacquin's plant (*Commiphora Madagascariensis*, Jacq. Hort. Schoenbr. 2., p. 66 et 249.), the supposed identity of which had suggested the specific name in the Flora Indica. The alteration, however, had not been entered in the MS. of the Flora Indica, when death deprived India of its most methodical and accurate Botanist. Royle grew this plant in the Saharunpore Garden, and was informed that it produced the Googul gum-resin, but recommends (Him. Botany, and more recently in his work on Materia Medica, Lond 1847) that the subject should be followed up by those who have the opportunity of examining the flowers and collecting the gum.

The tree now under consideration is abundant on rocky ground in Scinde, about Kurrachee, Garrah, Tattah, Jerrok, &c., in short wherever the limestone formation extends. It is therefore, most probably, very common in Beloochistan and up the Persian Gulf, and is one of the plants connecting the Syrian and Indian Floras.

1. Balsamodendron *Mukul*, (Hook.); spinescens; partibus novellis cum calyce pube capitatâ deciduâ sparsis, foliis *vel* simplicibus obovatis anticè serrato-dentatis *vel* trifoliatis foliolo medio sæpissimè rhomboideo-ovali cum foliolis lateralibus conformibus dimidio minoribus undulatè obliquo inciso-serrato, calyce campanulato, petalis ligulatis apice reflexis, staminibus oppositipetalis disci inæquidentati profundioribus recessubus sitis, carpellis (quotquot sint) perfectis, fructûs ovoideo-acuminati ad basin calyce fisso emarcido stipati valvulis epicarpialibus integris mesocarpiique cyathiformis margine 4-lobati lobis pyrenarum verticem acuminatam attingentibus. (Tab. VIII.)

Balsamodendron Roxburghii, Stocks in Bombay Trans. 1847. (excl. syn.)

Descr. A small tree four to six feet high, or more generally a stunted

bush, with thick branches spreading on all sides. In barren and rocky situations the gnarled limbs stretch from the crown along the surface of the rock. Branches knotty and crooked, with the ash-coloured bark peeling off in flakes, leaving exposed the under-bark which separates in large rolls, much resembling those of *Betula Rhojputia* ; the sub-terminal branches short and spiniform, with buds and secondary spines on them. Leaves and flowers collected at the end of short stunted buds, which finally develope into spines, or become young soft shoots, on which the leaves are arranged alternately.

Leaves smooth and shining, obovate, almost sessile, shallowly toothed anteriorly, the tapering base entire ; in thriving plants and luxuriant shoots inciso-serrate, cuneate-obovate, rhomboid or oval-acute, with a longer stalk from whose summit spring one, or more generally two, lateral leaflets, which are sometimes minute and entire, but generally serrated, half the size of the terminal leaflet, and overlapping it in its induplicate vernation.

Young leaves, while in the bud, covered with glandular hairs which soon drop off, a few only remaining in the axil and on the petiole. Flowers minute, in little bundles at the ends of the non-developed buds, with or without leaves, subsessile, with three minute bracts to each flower ; imperfectly unisexual, diœcious. MALES, with ovary small and barren ; FEMALES, with short stamens and small imperfect anthers.

Calyx cylindrical, 4—5-toothed, thickly covered externally (as are the bracts) with glandular hairs ; tube splitting as the fruit developes, and remaining spread out and withered at its base. Corolla of four, rarely five, strap-shaped, brownish-red petals ; margins slightly overlapping in æstivation, with an inflexed mucro ; tips of the petals curled back. Stamens 8—10, the four opposite the petals, shorter than the others. Disk 8—10-toothed, the alternate sinuses deeper and in these are situate the short stamens. Ovary bisulcate, two-celled, rarely three-celled, and still more uncommonly four-celled. There is no relation between the quinary proportion of the perianth, and this increased number of the carpellary leaves. Ovary tapering upwards and passing imperceptibly into the short and thick style. Stigma obscurely two-lobed. Ovules two in each cell, collateral, suspended. Drupe red when ripe, ovate-acuminated, often bluntly angular, marked by two sutures along which the epicarp and a portion of the mesocarp fall from the base in two fleshy valves, whose position is that of the car-

pellary leaves, leaving the nut enveloped by a four-cleft yellow pulp, whose arms meet at the apex. Nut ovate-acute, readily splitting into two. Each half has a groove on the commissural plane, bifurcating upwards. Into this groove fits a prolongation of the axis. The drupe has sometimes three sutures, and a six-cleft pulp; and rarely four sutures, four nuts, and an 8-cleft pulp. Out of a parcel of fifty-six, two had three sutures and one had four sutures, the rest being normal.

Seeds generally one in each cell or $\frac{1}{1}$ (two ovules being abortive), often $\frac{0}{1}$ (three abortive), more rarely $\frac{2}{1}$ (one abortive), still more rarely $\frac{2}{0}$ (two abortive), and very seldom $\frac{2}{2}$ (all perfect). Albumen none; embryo straight; radicle superior; cotyledons thin, intricately crumpled and plaited.

Obs. 1. This shrub is called *Googul* or *Guggur*, by the Hill-Belooches, who indeed do not know it by the name of Mukul. It yields the gum-resin Googul, which they collect and bring to the bazaars of Hydrabad and Kurrachee, where it sells at the rate of two Rupees the Maund of 80 lbs. At Bombay, its Tariff valuation is two Rupees the Maund. It is collected in the cold season by making incisions with a knife in the tree, and letting the resin fall on the ground. Hence the dirty and impure state in which it is found in the shops. I have obtained it from September to February, and have found it exude in large tears from a clean incision, of the colour, consistence, and opacity of "pus laudabile." My informants say that from half to a whole seer is yielded by a single tree. It is esteemed cordial and stimulant. It hardens and turns brownish-black very slowly.

Made up into a cake with bajree flour, it is commonly given to horses and cattle when they have a cold. The dealers from Cabool have a custom of administering it to their horses in the cold season, thinking that it keeps them in health and condition. The fruit and young shoots are applied to a similar purpose. The gum is made into a plaster and used to discuss tumours and boils, and is regarded as efficacious in expelling the guinea-worm, both taken internally and applied to the tumour. It is extensively employed by the Hindoos as incense for burning in their temples, although its smell is by no means agreeable. It is also much prized by builders, who mix it with the mortar and plaster used in the construction of houses of a somewhat superior description, where durability is an object. The Googul is boiled in water for a considerable time, when its spirit (as they phrase it) is communicated to the water, and

the dregs are thrown away. This solution of the gummy part, which according to Newman's analysis should be six drachms, two scruples in every ounce, is mixed with the lime, and employed with confidence to make the plaster adhere strongly, and to prevent it from crumbling and splitting. The Googul water is sometimes washed over the walls by itself.

The works on Materia Medica, by Ainslie, Royle, Pereira, Lindley, O'Shaugnessy, Guibourt, &c., may be referred to for additional particulars; and besides these, *Bdellium*, *Googul*, or *Indian Myrrh* is noticed in—

1. Ulfaz Udwiyeh. No. 864. *Khuzlaf*, A; n. 968. *Durukht*, P. *Dowm* A; (the Tree), n. 1383. *Mukul*. A. P. n. 222. *Aflatoon* (Plato!) *Googul*. H. n. 408. *Budliyoon* (Bdellium!) (the Gum).
2. Taleef Shereef. No. 809. *Googul*. n. 944. *Mukul*.
3. Forskahl, Materia Medica Kahirina, p. 158. "*Bdellium. Sumugh Mukul Azruk* (meaning Mukul gum of a colour like bluish-grey eyes, —glaucopsoia) est Myrrha imperfecta."
4. Arrian; Expeditio Alexandri, lib. vi. cap. xxii., *καὶ ἐν τῇ ἐρήμῳ ταύτῃ, λέγει Ἀριστόβουλος, κ.τ.λ.*, being the first of the four plants mentioned by him as growing in the desert of the Gadroü (Beloochistan, towards Mekran); the other three being (in the order he gives them) 2. *Jasonia*—nova species—"*I., glutinosæ* affinis, sed foliis inciso-serratis distinctissima:" *cel: et amiciss: Hooker in litt.* 2. *Rhizophora mucronata*, *Ceriops Candolleana*, *Bruguiera Rheedii*, and *Avicennia tomentosa*, (as to the general features), and *Ægiceras fragrans* (as to the flower). 4. *Euphorbia neriifolia*. I reserve the proofs of these statements for a future communication.
5. Makhzan-el-Adwiyeh. For the following translation of a portion of the article "*Mukul*" in the Makhzan-el-Adwiyeh ("Magazine" of Medicines) of Mohammed Hosayn Khan (from the Persian of the Calcutta Quarto Edition) I am indebted to Lieut. Burton of the Scinde Survey, than whom no one is more competent to overcome the difficulties of a corrupted text and an obscure author:—

"*Mukl.* In Puryàni *(Syriac) Muklà*, in Rumi *(Greek) Budliyún* in Arabic *Kafr* (Bitumen or Pitch,—called also *Kafr ul Yahud* or *Jew's Pitch*), and *Kawar*, in Persian *Búí Tahúdán* (the Jew's perfume—because that people use it in fumigation), in Hindustani *Gúgal*.

"It is the gum of a large tree about the size of the *Kundur* (Olibanum)

growing plentifully upon the shores of the sea of Umán (the sea on the E. coast of Arabia) and in Sanjar (Khorasan?) and India. Its general characteristic is bitterness, and it is of many kinds, as e. g., 1st the *Mukl-i-arzak* (bluish Bdellium) in colour reddish and bitter; 2nd *Mukl el Yahúd* (Jew's Bdellium), of a yellowish tinge; 3rd *Mukl-i-Sakalbi*, which is clouded, impure, black, and soft; 4th *Mukl-i-Arabi* (Arabian Bdellium) which grows in Yemen, and is of the colour of the *Badanjan* (ripe fruit of the Egg-plant, i. e., greenish-black). The best kind is clear, pure, and brilliant, viscous, adhesive, soft, sweet-smelling, yellow, and bitterish. When thrown upon the fire it emits an odour like the laurel, and readily dissolves in water. It must be unmixed with wood, straws, sand, earth, or such matters. Its properties last for twenty years. When old its bitterness increases; and the older it is the darker it becomes, exchanging its softness for dryness and hardness, especially the Arabic, as they mix it with myrrh."

My friend Assistant-Surgeon Carter showed me fine specimens of the "Mukul" gum collected by him on the southern coast of Arabia, together with numerous other gums, all accompanied by admirable drawings of the trees producing them. There is, therefore, some error in the statement of Dr. Malcolmson (Royle's Materia Medica) that Bdellium is not produced in Arabia.

Moreover, the "Mukul" and the tree producing it, are, from Dr. Carter's specimens, identical with the Scinde Googul and its tree, as might be expected from the great similarity between the vegetation of the rocky part of Scinde and that of Arabia. The range of our *Googul* Tree is therefore—Arabia (*Dr. Carter*); and, according to my own observations, in rocky ground throughout Scinde, at Deesa in Marwar, and lately in Beloochistan Proper. It flowers in March and April, and the leaves and young shoots appear in April and May. In sheltered situations, as under the bank of a water-course, it may be found in fruit, flower, and leaf, for the greater part of the year.

Reference to the Figures. Tab. VIII. Specimens in different states of leaf, flower, and fruit, nat. size; Fig. 1, male flower; f. 2, section of ditto; f. 3, section of female flower; f. 4, sterile stamens; f. 5, section of fruit, with two carpels; f. 6, ditto with three carpels, (all magnified); f. 7, fruit, nat. size; f. 8. 8, epicarp of the ripe fruit as it separates into two valves, leaving exposed; f. 9, the pulpy fruit, *nat. size.*

THE BAYEE BALSAM TREE. (Tab. IX.)

2. Balsamodendron *pubescens;* inerme; partibus novellis pube detergibili subfurfurosis, foliis bi-tri-jugis cum impari foliolis integris medio obovato lateralibus sæpissimè oblongo-obovatis, calyce urceolato-campanulato, petalis obovato-acutis apice patentibus, staminibus æquilongis disci æquidentati sinubus sitis, ovarii bicarpellaris loculo altero penitùs abortivo, fructus globoso-acuti ad basin calyce integro emarcido stipati valvulis à basi semibifidis mesocarpiique cyathiformis margine 4-dentati dentibus pyrenarum verticem obtusam haud attingentibus. (Tab. IX.)

B. pubescens, *Stocks in Bombay Trans.*, 1847.

DESCR. A small tree, or stunted shrub, much resembling the Googul tree, but the sub-terminal branches, though abrupt, are not spiniform. Bark peeling off in flakes. Leaves ternate, fascicled at the end of the stunted buds, but on the young soft shoots alternate, with an additional distant pair of leaflets; long-petioled, soft and downy (as are the young shoots) with short furfuraceous pubescence. Leaflets obovate, entire, often retuse; the terminal one stalked, the lateral ones subsessile, often somewhat rounded. Flowers sessile in bundles at the end of the stunted buds, unisexual and diœcious as in the Googul. Calyx-tube shallow, contracted at the mouth. Petals red or white, with æstivation as in the Googul, spreading but not reflexed at the apex in anthesis. Stamens equal in height. Disk equally toothed. Ovary, as in the Googul. Drupe red, globose with a short point, marked by four conspicuous white sutures, the alternate ones (corresponding to the mid-rib of the carpellary leaves) not reaching to the apex of the fruit. Valves two, each cleft half-way up to the secondary or false suture. Pulp orange-coloured, four-toothed upwards, not reaching to the apex of the nut which is left naked. Nut ovate, obtuse; one of the halves into which it splits is a mere flat plate or scale, the other is a perfect cell grooved on the commissural plane. Sometimes the number of carpellary leaves is increased. Thus out of a parcel of 120 there were four, and out of a parcel of 200 there were seven, which had six sutures and a pulp six-toothed towards the top. In these cases the additional carpel was represented by a second flat plate, or more rarely there were two perfect cells and one abortive. One seed in each perfect carpel. Albumen none; embryo straight. Radicle superior; cotyledons crumpled and plaited.

This shrub is called *Bayee* by the Hill-Belooches, who make no use of it. Its young shoots aud buds are remarkably fragrant when bruised. In the cold season it yields a small quantity of a tasteless, inodorous, brittle gum, almost entirely soluble in water. It flowers in March and April, and its leaves and young shoots appear in April and May. It is a native of Beloochistan and the hills which separate that province from Scinde; probably also of Afghanistan, attaining its southern limit about Kurrachee.

Reference to the Figures. Tab. IX. Specimens in different states of leaf, flower, and fruit. Fig. 1, fertile flower; f. 2, section of the same; f. 3, male flower; f. 4, section of fruit with two carpels; f. 5, section of ditto with three carpels, (all magnified); f. 6, nut with its pulp, *nat. size*; f. 7, epicarp of the ripe fruit as it separates and leaves the nut with its pulp exposed (as in the previous figure), *nat. size.*

Dr. Arnott hints at two sections of *Balsamodendron*, depending on the relative depth of the calyx. The Googul has its calyx long and tubular. The one just described has its calyx shallow, and this is especially observable in a section of the flower. Moreover its fruit differs in having two additional imperfect sutures, in which it agrees with *B. Gileadense* and *B. Kaful*, as we gather from Forskal, and with *B. Berryi* and *Wighiti*, as Dr. Wight kindly informs me.

Reference to the figures, Tab. IX. Specimens in different states of flowers and fruit,—*nat. size.*

Notes and Observations on the Botany, Weather, &c., of the United States, made during a tour in that country in 1846 *and* 1847. *By* Wm. Arnold Bromfield, M.D., F.L.S., &c.

(*Continued from p.* 112.)

The Chestnut, *Castanea vesca*, abounds about Ancaster, where the trees, though not of very large dimensions, looked perfectly healthy and vigorous. This valuable tree, which is not given in the Flora Borealis Americana as a native of British America, would appear to reach its polar limits nearly in the latitude of Niagara, or a little to the northward (lat. 44°) of the Falls, and in Canada to be confined to the vicinity of Lake Ontario, if not to this particular district; for though so plentiful around Hamilton, I am told it disappears entirely a little farther north, and is not found in the adjoining townships. I cannot discover any character by which to distinguish the American from the

European Chestnut. The fruit is said to be smaller and sweeter in the former; but I apprehend the comparison has been made with that of the cultivated tree, or *marrons* of the French. The nuts of the so-called wild chestnut of our English woods (to which it is a very dubious native) are not larger than in the trans-atlantic variety, if such the latter can be termed where no perceptible difference exists. Sassafras, *S. officinalis*, is still pretty frequent and of tolerable dimensions in sheltered woods, in the low marshy parts of which the Spice or Fever-bush, *Benzoin odoriferum*, was observed adorned with its fine coral-red fruit. The Witch Hasel, *Hamamelis virginicas*, was a common shrub as undergrowth in the woods, and was now laden with the ripe capsules of the previous year's flowers, and which remain hanging till the leaves decay and drop, and a fresh succession of blossom bursts into life just as vegetation is sinking into the torpor of a long winter's sleep,—a strange conjunction of youth, maturity, and decrepitude. The English and the German name (*Zanbernuss*) well express this apparently unnatural union, as though it were the effect of sorcery upon the plant, which, in its mode of growth, colour of the smooth bark, and general aspect of the leaves, bears no slight resemblance to the common hasel of Europe; nor are the clusters of capsules, at a first glance, much unlike bunches of filberts. The economy of the Witch Hasel, where such opposite processes and extreme phases of vegetation are carried on and manifested simultaneously, would be a curious and instructive subject of inquiry in vegetable physiology. The distribution of this singular shrub, which is more worthy of a place in British gardens than it has yet been favored with, would seem to incline rather to the north and east than to extend in the opposite direction; at least I met with it much more abundantly in Upper Canada and the adjoining parts of the United States than in the central and southern portions of the Union.

In one of my rambles in search of plants, with a relative of my own, I saw the Leatherwood, *Dirca palustris*, in considerable plenty in a damp bottom or ravine, growing to the height of five or six feet, and very much branched. The branches lie spreading and divaricate in a horizontal position, so as to form a flat or depressed head; these, as well as the bark, are extremely like those of our Daphne Laureola, and are equally tough and flexible. The stems vary from the thickness of the finger to that of the wrist, the wood excessively soft, and almost as sectile as cork. This shrub is interesting, as being the only repre-

sentative in the United States of the natural order Thymeleaceæ. The aborigines, it is said, made the bark into cordage, for which its extreme tenacity admirably fits it. A worthy friend in Charleston, S. C., related to me, that in a conversation he once had with a surviving actor in the war of independence, the latter assured him, that towards the close of that event (when, previous to the final evacuation of the country by the British, Carolina was a prey to the last fierce struggles for ascendency between the Whig and Tory or American and royalist factions, and a relentless partizan warfare was carrying on throughout the States), the bark of the Leatherwood supplied a too ready and fitting instrument of vengeance in the summary executions which usually followed defeat on either side, during their sanguinary and lawless conflicts amid the swamps and forests of the interior. Nor did my friend's informant hesitate to avow himself a *particeps criminis* in having assisted to "string up" certain unfortunate adherents of the party opposed to his own, who fell into his hands, with this very primitive kind of halter.

Pine woods seem wanting to the neighbourhood of Hamilton; but when the deciduous woods are felled, the Weymouth Pine, *P. Strobus*, springs up in the cleared places abundantly. This and the Hemlock, *P. Canadensis*, appear to be the only indigenous pines hereabouts. At Binkley's Corner, where the Dundas and Ancaster roads unite, I gathered *Staphylea trifolia* and *Clematis virginiana;* the latter, which is the representative of our *C. Vitalba*, besides having ternate leaves and diœcious flowers, is a more delicate or less woody and robust species, though otherwise much resembling it; nor does it grow in such overwhelming masses as our Travellers' Joy, but mostly as single plants over the trees and bushes. The Elder, *Sambucus nigra*, var. *Canadensis* (*S. Canadensis*, L.) abounds here as in most parts of America, but appears to me to differ in no one essential particular from the European kind. It is commonly of humbler stature, and the leaflets are usually more numerous (six or eight pairs instead of five), and narrower or more lanceolate; but the same form and number are sometimes found in our English Elder, and in all that regards the flowers and fruit I can find no appreciable difference between them. The stem in both is equally woody, though commonly described in books as only half shrubby in *S. Canadensis;* yet this character is not noticed in others.

The lowermost pair of leaflets is very frequently compounded in the American form, each leaflet being two or even three cleft; but I have seen the same in the European variety occasionally; hence this mark cannot be taken for a specific character, as has been done by Willdenow* and other authors, who state, moreover, that the berries of *S. Canadensis* are but half the size of those of *S. nigra*, which my own observations do not confirm. What the half hardy suffruticose species, described by Loudon † and various writers as *S. Canadensis*, may be, I am at a loss to understand; I can only say I have never fallen in with anything answering to it in America, or met with any nearer approach to an Elder different from our own, besides the slight variety mentioned above. It is not to be wondered at, that a plant, which can with equal facility accommodate itself to the pinching cold of Lower Canada and the sultry sun of Trinidad and Barbadoes (in the gardens of which islands I have seen it thriving and flowering luxuriantly) should exhibit some variations of character and aspect under so great a diversity of climate, that at first view, or in the dried state, may appear to offer good specific distinctions. There are, perhaps, few examples amongst ligneous vegetables of such climatic adaptation in any one species as is evinced by the Elder; and hence we find it distributed in some one or other of its aberrant forms, as Sir Wm. Hooker has remarked to me, over a great part of the world.

The weather, during my stay at Ancaster and its neighbourhood, was not such as to give a favourable impression of the climate of this part of Upper Canada. I had, indeed, before visiting it, abundant proofs of its variability in a series of excellent daily observations made by Dr. Craigie, at Hamilton and Ancaster, for several years past, and of which, through Dr. C.'s kindness, I possess a complete set to the present date. Monthly communications by letter with my friends in Canada West amply bear out the fact of this variableness, and of the extreme uncertainty of the seasons in the vicinity of the great lakes, where, notwithstanding that the winters are milder and the summers somewhat cooler and more humid than in parts of the country more remote from these vast inland bodies of water, the diurnal, monthly, and annual vicissitudes are still excessive. I shall adduce but a single example to shew the extreme discrepancy betwixt the mean temperature of the

* Berlinische Baumzucht. Berlin 1796, 8vo. p. 355. † Arboret. Brit. art. *Sambucus*.

same month in different years at Ancaster. In 1837, the mean heat of December was 40° 53′, which is nearly one degree above the average of the same month in London; in 1845 the mean temperature of December was 22! or 18½ degrees below that for 1837, being in the former case 10° 70′ above, and in the latter 7° 83′ below the average of eleven years, which is 29° 83′. Winter and summer are equally uncertain and capricious in their advent, continuance and departure; the perpetual recurrence, at the former season, of thaws and mild open weather render sleighing a very precarious medium of communication, whilst at the warmer period of the year garden produce is ever in peril from the severe night frosts, to which every month of summer is at times liable. As a specimen of the climate of the lake districts of Upper Canada, I subjoin the following tables of monthly means, the result of eleven years of observations by register thermometers, by Dr. Craigie, at Ancaster, Gore District, C. W., N. lat. 43° 10′, W. long 80° *, from 1835 to 1845 inclusive:—

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
27·49	25·45	33·79	43·80	54·59	63·20	68·72	66·42	59·00	47·34	37·63	29·83

Mean temperature for eleven years, 46·40; spring 44·06; summer 66·11; autumn 47·99; winter 27·59. Highest temperature 95, lowest —9.

From the foregoing table it will appear how much more potent is the influence of the great body of fresh water which environs this lake district of Canada, in mitigating the cold of winter, than in allaying the heat of summer, and that for reasons which will be given presently. The mildness of the winter is very remarkable when compared with that of other parts of the country under the same parallel, since the greatest cold registered in eleven years is but nine below zero, quite trifling compared with the intensity of the frost experienced in other parts of America, situated even some degrees to the southward, but removed from the calorific agency of these inland seas.

The climate of the middle and in some measure of the more temperate northern States, as Connecticut and Rhode Island, including the lower part of New York, is, as far as regards temperature, an exaggeration of that possessed by the countries of central Europe ten degrees

* Approximately and certainly within a very few minutes of the true positions. The elevation of Ancaster above Lake Ontario, if any at all, must be inconsiderable, and that lake being the lowest of the chain, the height of the village above the level of the Atlantic cannot be sufficient to affect the temperature to any notable extent.

farther north, and situated like the former on the sea board. We find as strong an analogy in the meteorological character of that portion of both continents which lies between the parellels of 40°–42° and 50°–52°, as in its animal and vegetable productions; and since these climatic relations have doubtless much to do with determining the corresponding similarity in the type of vegetation just alluded to, some remarks on this head, as bearing closely on the main subject to which this Journal is devoted, will not, I trust, be here thought out of place. The same resemblance betwixt the cis-atlantic and trans-atlantic climates of Europe and America, are distinctly traceable on the north and south of the parallels above mentioned; but these have been selected as being those between which the climate of the United States coincides most nearly with that of England and the western part of central Europe generally. The regions they include are, indeed, to use the words of Dr. Forry,* "the battle ground on which Boreas and Auster are contending for the mastery," or, it may be called, the neutral territory on which meet the attributes of the north and the south.

The isothermal line of 51° Fah. has its convex summit in the west of Europe and its concave one in eastern America, on points pretty nearly coincident in both hemispheres betwixt their respective latitudes of 40°–42° and 50°–52°, and though the isocheimal and isotheral curves are not parallel to those of mean annual temperature, the general similarity betwixt these two systems of climate is not materially affected by the discrepancy. We find in both the same uncertainty attendant on the setting in of the seasons, the same intercalation of cool and cloudy summers, and of mild open winters, with those of an opposite or medium character,—the same irregularity in the direction and duration of the winds, and in the extent and frequency of the oscillations of the barometric column; all that fickleness in short which the prevalence of various antagonist or disturbing forces is found to produce in the meteorological constitution of the atmosphere in countries lying under the middle latitudes and in the vicinity of a boundless ocean.

Among the popular fallacies relating to climate, which have been generally received as undisputed facts, there are two which I shall men-

* The climate of the United States and its Endemic Influences, by Samuel Forry, M.D., New York, 8vo.: a work replete with curious and original matter and remarks, medical, statistical, and meteorological.

tion as bearing on the subject under consideration. The former of these, though it may appear to be less relevant to the question, will be found, from the statements and tables quoted, to confirm and elucidate the second. An opinion has very long prevailed, and is even now generally entertained by those who have not given their attention to meteorological subjects, that the summers of very northern countries lying within or continguous to the arctic circle, as Norway, parts of Sweden and Russia, though short, enjoy a temperature fully equalling, or, whilst it lasts, surpassing that of the same season in more southerly latitudes. The summers of these countries have almost become proverbial in popular belief, not for their transitory duration only, but for the heat which is supposed to characterize them, yet the researches of modern science completely dispel this assumption. The origin of so strange a meteorological error it would not perhaps be difficult to account for, were this the place for such discussion; it is sufficient here to observe, that experience fully proves, how, on approaching the poles, the mean temperature of summer follows the general law of decrement which governs the remaining seasons, though the ratio of diminution is smaller than that which obtains for the winter months on the same parallel.*

True it is that the mean temperature of the three summer months in London, for instance, is but little above that of the same season at Stockholm and St. Petersburgh, (it is not below the summer heat of those places, as many imagine); but the comparison is here made betwixt a city of western Europe having an Atlantic or ocean and insular climate, with two other towns possessing the opposite characteristics, in a great degree, of an eastern and continental one, and is of course inconclusive of the position assumed. But let the comparison be made of the summer heat of London with that of Bergen, or even of Christiania (places, like itself, on or near the western coast of Europe, but in

* The statistics of terrestial temperature seem to shew that the zone of maximum summer heat is included between the sub-tropical latitudes, comprising a band of about six or eight degrees north and south of the two solstitial circles, or from lat. 25 to 33. The greater part of this band lies beyond the region of periodical rains, which temper the heat, both by the evaporation they give rise to, and the screen of clouds interposed between the earth and a vertical sun within the tropics; it is consequently exposed for several months to the vehement action of the sun at a time when his distance from the equator is greatest, and his declination diminishes least from day to day; the small obliquity of his rays being fully compensated by the absence of clouds and continuous rain, and by the more sensibly increased duration of his stay above the horizon.

latitudes nearly corresponding to those of the Swedish and Russian capitals,) and the advantage of the more southerly position of the British metropolis becomes apparent in the higher temperature of summer as of all the other seasons, as will be evident from the subjoined table, exhibiting the temperature of the year and four seasons, &c. of six places situated at the sea level, and all, except the last, under nearly equal parallels of latitude.

	Lat. N.	Long.	Annual temp.	Spring.	Summer.	Autumn.	Winter.	Warmest month.	Coldest month.
Christiania	59 54	10 55 E.	41·72	39·20	59·54	42·44	25·16	61·70	23·36
Stockholm	59 21	18 5	42·08	38·60	60·98	43·70	25·52	63·68	23·90
Upsala	59 52	17 38	41·54	38·12	59·1	43·16	25·34	61·34	23·18
Abo	60 27	22 18	40·28	36·38	60·26	41·76	22·28	63·68	21·02
St. Petersburgh	59 56	30 19	38·30	35·60	60·26	40·46	16·88	62·42	13·46
London	51 31	00 5 W	50·39	49·10	62·78	51·26	39·56	64·04	37·40

The above results were selected from the copious tables of Mahlmann, in Walker's edition of Professor Kämtz's Meteorology, 1845, 8vo. the calculations reduced by me from the centigrade scale into that of Fahrenheit. The value of having these tables under the eye for reference will be seen when I come to compare the American with the European climates, a little further on.

The effect of an inland position, in raising the temperature of summer, is much smaller than is generally supposed, whilst its influence in depressing that of the winter months increases prodigiously with the distance from the shores of the ocean. This will be made evident by the following tables taken like the foregoing from Mahlmann, and reduced like that to degrees of Fahrenheit, and the heights above the sea from metres into English feet. This table exhibits the mean temperature of the year and four seasons at six places, nearly equal in latitude but progressively receding eastward from a maritime to a deeply inland or continental climate.

	N. Lat.	Long.	Annual temp.	Spring.	Summer.	Autumn.	Winter.	Warmest month.	Coldest month.	Height in feet.
London	51 31	0 5 W	50·39	49·10	62·78	51·26	39·56	64·04	37·40	—
Brussels	50 51	4 22 E.	50·36	50·18	64·76	50·51	36·50	66·84	34·16	190
Berlin	52 31	13 12	47·48	47·12	63·68	48·38	29·94	64·94	26·42	128
Warsaw	52 14	21 00	45·50	45·20	63·50	46·40	27·50	64·76	24·80	397
Tambov	52 47	41 41	41·18	——	65·12	——	16·34	68·00	9·14	203
Irkutsk	52 16	104 5	31·80	23·90	60·68	28·04	00·32	63·50	3·10	1342

With full allowance for the reduction of temperature consequent on the moderate elevation of five of these places above the sea, we cannot

fail being struck with the very slight increase of summer heat experienced in advancing eastward over 104½° of longitude, compared with the enormous diminution of the winter temperature, amounting, at the two extremes which separate London and Irkutsk, to 39 degrees, with a difference of only 0·45, or ¾ of a degree of latitude, whilst the mean annual temperature has fallen from above 50 in western Europe, to a little below the point of congelation, on nearly the same parallel in eastern Siberia. We see that Brussels presents the most favourable combination of warm summers with mild winters of any town in the series, which is just what we should expect, since that city enjoys the advantage both of a maritime and inland climate, its main land position removing it from the depression of temperature in summer, consequent on too great a degree of insularity, and from a still lower temperature in winter, which it would be its lot to endure, were its distance from the coast more considerable. The same union of winters and summers of high mean temperature, seems to obtain in Belgium and Holland generally; judging from such registers as I have had the means of consulting, and my former personal but very limited experience of the climate of both countries. A narrow sea, like that which washes the shores of Belgium, gets heated in summer to an approximation with the temperature of the land, and radiates heat far more slowly: it is not likely, therefore, to take it from the latter when both are at their maximum temperature; but no sooner does the earth begin to radiate into space more heat than it receives from the daily declining power of the sun, than the loss is made up in a great measure from the stores of caloric accumulated in the adjacent ocean, the warm vapours from which, condensing into mist or clouds, retard the farther dispersion of terrestrial heat, and considerably mitigate the rigour of winter. To the favourable position of Stockholm on the islets of the Mälar Lake, is attributed its superiority of climate, both in summer and winter, over that of St. Petersburgh, the difference at the latter season being no less than 8° 64′ in favour of the Swedish capital, with an advantage of 0° 72′ over the Russian metropolis in summer. Stockholm enjoys, in fact, that modified insularity of climate, which insures to it, as to the cities of Holland, Belgium, and Italy, the highest possible temperature at all times of the year which the respective latitudes of these places will permit.* On casting our eye over the table we find that Tambow

* This applies also to Copenhagen, which has one of the most genial summer and winter climates of any of the northern capitals; as Petersburgh has the very worst.

has a winter fully as rigorous as at St. Petersburgh, though seven degrees farther south; yet the heat of summer, at this very inland place, is scarcely above that of Brussels, barely one degree nearer the equator than itself, and at about the same elevation. At Irkutsk, in lat. 52° 16′, and the easternmost place in the series selected for illustration, the subsoil must be very little above the point of congelation, as the mean temperature of the air is somewhat below it; and allowing 5° Fahr. for its elevation of 1342 feet, the mean heat of Irkutsk would still be only 36° 80′, or below thatof St. Petersburgh, and this is probably too high an estimate. May not the well known poverty of the Siberian Flora, commencing eastward of the Uralian mountains to Dahuria and the Sea of Ochotsk, in hardwood or deciduous trees, (nearly all those indigenous to Europe failing beyond that chain) be less owing to the mere rigour of winter than to the extreme low temperature of the subsoil, to which the roots of the larger trees must descend; whilst those of the various species of *Caragana*, *Halimodendron*, and other shrubs so characteristic of the Siberian Flora, penetrate only to a depth at which the sun's rays can be effectual in raising the temperature sufficiently for vigorous vegetation during some months of the year. The *Coniferæ* alone, protected by their resinous secretion, seem endowed with power to resist a continued low temperature, and to strike their roots into a perpetually frozen soil. We observe the same phenomenon in America as in northern Asia: there, around Hudson's Bay, in Labrador and north of the Saskatchewan, where the mean annual temperature of the earth sinks to 32°, nearly every kind of hard-wood tree, common a few degrees farther south, has disappeared; and pines, with a few poplars, (*Populus trepida* and *balsamifera*) willows, and under-shrubs, are the sole representatives of arboreous vegetation.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

(*Continued from p.* 233.)

Calcutta to Darjeeling in Sikkim-Himalaya.

Patna is the strong-hold of Mahomedanism, and from its central position, its command of the Ganges, and its proximity to Nepaul, (which latter has been aptly compared to a drawn dagger, pointed to

the heart of India,) it is an important place. For this reason there are always an European and several detachments of the Company's Service stationed there.

At Patna, famous for its manufactures of cotton cloths, especially table-linen, towelling, &c., I was chiefly engaged with Dr. Irvine, in botanizing, or naming my plants. I received from this gentleman much excellent information on various subjects. In the neighbourhood there is little to be seen; and the highly cultivated flat country is unfavourable to native vegetation. I picked up a few wild plants, and gathered some culinary ones in Dr. Irvine's excellent garden. The cholera broke out during my stay, and has raged fearfully since. This pestilence, that walketh unchecked at noon-day, was prevalent at every succeeding halting-place which I visited, its ravages being, however, confined to the natives. The *mudar* plant (*Calotropis*) is abundant here; and I assure you its properties and nomenclature are far from settled points. On the banks of the Ganges, the larger, white-flowered, sub-arboreous species prevails; in the interior, and along my whole previous route, the smaller purple-flowered variety only is seen. The species look very different, but when gathered there is extreme difficulty in recognizing them. Mr. Davis, of Rotas, is in the habit of using the medicine copiously, and can vouch for the cure of eighty cases, chiefly of leprosy, by the exhibition of the *white mudar*, gathered on the Ganges; whilst the purple of Rotas and the neighbourhood is quite inert. Dr. Irvine, again, uses the purple only, and finds the white inert. Among the European and native Doctors, who know the two plants, I find that all give the preference to the *white*, except Dr. Irvine, whose experience over various parts of India is entitled to great weight.

March 29. Dropped down the river with the current, experiencing a succession of E. and N. E. winds from Patna during the whole remainder of the voyage. Such a prevalence in this part is very universal in the month of March, and it rendered the passage in my sluggish boat sufficiently tedious. In other respects I had but little bad weather to complain of: only one shower of rain occurred and but few storms of thunder and lightning. The stream is very strong, and its action on the sand-banks conspicuous. All night I hear the falling cliffs precipitated with a dull heavy splash into the water,—a pretty spectacle in the day-time, when the whirling current is seen to carry a cloud of white dust, like smoke, along its hurrying course.

The Curruckpore hills, the northern boundary of the gneiss and granite range of Paras-Nath, are seen first in the distance, and then throwing out low loosely timbered spurs towards the river; but no rock or hill comes close to the banks till near Monghyr, where the strange sight of two islets of rock, rising out of the bed of the river, meet the eye. They are of stratified quartz, dipping, at a high angle, to the S. E. as far as I could observe, quite barren, each crowned with a little temple. The swarm of boats from below Patna to this place is quite incredible.

April 1. Arrived at Monghyr, by far the prettiest town I had seen on the river, backed by a long range of wooded hills,—detached outlyers of which rise in the very town. The banks are steep, and they appear more so from the fortifications, which are extensive. A number of large, white, two-storied houses, some very imposing, and perched on rounded or conical hills, give an European aspect to the place, which is certainly extremely pretty. I landed in the evening, and dined with Dr. Hastings. His house is in the old Fort, which is laid out in walks, and has a nice public garden included within the walls.

Monghyr is celebrated for its iron manufactures, especially of muskets, in which respect it is the Birmingham of Bengal. Generally speaking, these articles are poor weapons, though stamped with the first English names. A native workman will, however, if time and sufficient reward be afforded, turn out a first-rate fowling-piece. The inhabitants are reported sad drunkards, and the abundance of *Toddy Palms* is quite remarkable. The *Phœnix sylvestris* I have never seen wild, nor thriving under shade, as the dwarf wild ones do on the Soane.

In the morning of the following day Dr. Hastings kindly drove me to the hot springs of Sita-kund, (wells of Sita), a few miles south of the town. The hills are hornstone and quartz, stratified and dipping southerly with a very high angle. They are very barren, quite naked in fact, and evidently identical with those on the south bank of the Soane, skirting, in both cases, the granite and gneiss range of Paras-Nath. The alluvium of the banks of the Ganges is obviously an aqueous deposit very subsequent to the protrusion of these hills, and is perfectly plane up to their bases. Still less does it appear to me to be a deposit by the Ganges, as imagined by many persons, though not, I should think, by geologists. The latter river has its course through the

alluvium, as its feeders have through the gneiss of the Sub-Himalaya. The contrast between the fertility of the alluvium and the sterility of the protruded quartzose and flinty rocks, is very striking, cultivation running up to these fields of stones, and suddenly stopping.

Unlike the Soroock-kund hot-springs, those of Sita-kund rise in a plain, and were once covered by a handsome temple. All the water is collected in a large tank, some yards square, with steps leading down to it. The water, which is clear, pure, and tasteless, though covered with gaseous bubbles, has a temperature of 140° (9¾ am.) Two cold springs, also collected in tanks, are but a few yards distant. The surplus warm water flows away through a meadow, but presents there no peculiar features of vegetation, except the precocious flowering of a *Sagittaria* and *Pontederia*. *Lemna* and *Azolla* abounded, at a temperature of about 90°, with the above, *Ranunculus sceleratus*, and *Rumex Wallichii*, the two latter were in no respect forwarder than similar specimens along the banks of the Ganges. Crowds of Devotees and attendant Brahmins flocked round the well, performing and receiving such cures as warm water and faith will always effect. Walked to one of the rocky bosses of quartz; but the sun was so powerful that I could not go far. It was sterile, but afforded abundance of a columnar *Euphorbia*,* *Olax scandens*, *Guilandina Bonduc*, *Cardiospermum Halicacabum*, a *Tragia*, and such-like *vegetable thermometers*.

The Sita-kund hot springs were considered (Hodgson tells me) by Mr. Scott Waring, to flow over a bed of Pyrites; and their varying temperature he refers to the strength of the current, exposing more or less of its surface to this influence. The waters are so pure as to be exported copiously, and the Monghyr manufactory of soda-water presents the anomaly of owing its purity to Sita's ablutions!

April 4. On my passage down the river I passed the picturesque rocks of Sultangunje: they are similar to the Monghyr rocks, but very much larger and loftier, and appear to consist of broken-up masses of probably quartz, of excessive hardness. The dip is very high, and to about S. W., as far as I could judge, looking from the boat, which, from the violence of the current and N. E. gale, swung past, pirouetting to the holy places in a most irreverent manner. One rock, a round-headed mass, stands on the bank, capped with a triple-domed Ma-

* These columnar *Euphorbias* are very typical of dry rocks, whether sandstone or others. They grow equally well when planted as hedgings in the alluvium, but never are natives of such soil.

hommedan tomb, palms, and *Fici*. The other, which is far more striking, rises isolated in the bed of the river, and is crowned with a Hindoo temple, its pyramidal cone surmounted with a curious pile of weather-cocks, and two little banners. The current of the Ganges is here very strong, and runs in deep black eddies between the rocks. Though now, perhaps, eighty or a hundred yards from the shore, the islet must have been but recently insulated; for it retains a portion of the once connecting alluvium, in the form of a short flat-topped cliff, about thirty feet above the water. Some curious-looking sculptures on the rocks are said to represent Naragur (or Vishnu), Suree and Sirooj; but to me they were quite unintelligible. The temple is dedicated to Naragur, and inhabited by Fakeers. It is the most holy temple on the Ganges.

April 5. I arrived at Bhaugulpore, and took up my quarters with my excellent friend Dr. Grant, till he should arrange my Dawk for Sikkim.

Bhaugulpore, like Monghyr, is situated on very undulating and hilly ground, the subjacent rock, however, not bursting through the soil, as at Monghyr, but rolling along under ground, and no doubt a continuation of the same rock as that of Monghyr, Sultangunje, and the Colgong rocks, further up the river. The station is large and beautiful, the soil being fertile, and the park-like appearances of the enclosures charming. The church, too, is an exceedingly pretty building, in perfectly correct taste, and the only one I have seen in India, of which I can say so much: it is Gothic, of good stone, with a broad square tower, a very common Somersetshire type of church, in short, and so well placed as to present a charming object from many points of view. The ecclesiastical architecture in India is generally so shocking, that such a building as this deserves praise.

The town has been supposed (by Capt. Franklin) to be the much sought Palibothra, and a dirty (now all but empty) stream hard by (the Chundun) the Eranoboas; but, as I told you before, Ravenshaw has brought all existing proofs to bear on the Soane. It is, like most hilly places in India, S. of the Himalaya, the seat of much Jain worship. The temples on Mount Manden, a few miles off, were 540 in number. At Suffie Ghur and Gund-lutter, the assumed summer-palaces of the kings of Palibothra (Franklin), the ground is covered with agates, brought from the neighbouring hills, which were, in a rough state, let into the walls of the buildings. These agates perfectly resemble the

Soane pebbles, and they assist in the identification of these flanking hills with those of the latter river.

Again, near the hills, the features of interest are very numerous, whether as regards the human race or other branches of Natural History. The neighbouring mountains of Curruckpore, which are a portion of the Rajmahal and Paras-Nath range, are peopled by tribes representing the earliest races of India, prior to the invasion of young Rama, prince of Oude, who spread Brahminism with his conquests, and won the hand of king Jurunk's daughter, Sita*, by bending her father's bow. These people are the Jungle-terry tribes, a middle-sized, strong, very black, and black-haired race, with thick lips. The Koles, as they are also called, have no vocation but collecting iron from the soil, which occurs abundantly in nodules. They eat flesh, whether killed by themselves, or that of animals which have died a natural death, and mix with Hindoos, but not with Mussulmen. There are other tribes, vestiges of the Tamulian race, differing somewhat in their rites from these, and approaching, in their habits, more to Hindoos; but all are timorous with strangers, and segregate themselves from both Europeans and natives of the plains.

The hill-rangers, or Bhaugulpore-rangers, are a local corps, all natives of the Rajmahal hills, maintained by the Company for the protection of the district. For many years these hill-men were employed in predatory excursions, which, owing to the nature of the country, were checked with great difficulty. The plan was therefore conceived, by an active magistrate in the district, of embodying a portion of these people into a military force, for the protection of the country from invasions of their own tribes; and this scheme has answered perfectly.

To me the most interesting object in Bhaugulpore was the Horticultural Gardens, whose origin and flourishing condition are due to the activity and enterprise of Major Napleton, commanding the hill-rangers. The site is remarkably good, consisting of fifteen acres, that were, four years ago, an indigo-field, but now a really smiling garden. About fifty men are employed; and the number of seeds and vegetables, annually distributed, is very great. Of the trees, used for shade and for ornament, the most conspicuous are the Tamarind (of which one superb specimen stands conspicuous near the seed-room,) *Tecoma jasminoides*,

* Sita was afterwards carried off by the giant Rawun, but rescued by Rama, and required to purify at Sita-kund.

Erythrinas, *Adansonia*, *Bombax*, *Teak*, *Banyan*, *Peepul*, *Sissoo*, *Casuarina*. *Terminalias*, *Melia*, *Bauhinias*. Of introduced species for ornament or use, English and Chinese flat Peaches (pruned to the centre to let the sun in), Mangos of various sorts, *Eugenia Jambos*, various *Anonas*, *Litchi*, *Loquat* and *Longan*, *Oranges*, *Sapodilla*; apple, pear, both succeeding tolerably; various Caubul and Persian varieties of fruit-trees; figs, grapes, Guava, apricots, and jujube. The grapes look extremely well, but require great skill and care in the management. They form a long covered walk, with a row of Plantains on the W. side, to diminish the effects of the hot winds, but even with this screen, it is inferior to the opposite trellis of grapes. Easterly winds, again, blight them and other plants, by favoring the abundant increase of insects, and causing the leaf to curl and fall off; and against this evil there is no remedy. With a clear sky the mischief is not great; under a cloudy one the prevalence of such winds is fatal to the crop. The white ant, too, attacks the stems, and is best destroyed or checked by washing the roots with lime-water, yellow arsenic, or tobacco-water.

The ornamental shrubs are *Oleander*, *Bougainvillea*, *Tabernæmontana*, *Ruellia*, two sp.; *Lantanas*, *Passifloras*, of sixteen species and varieties; *Verbenas*, *Ixora*, *Dracæna*, *Durantas*, *Quisqualis*, *Pergularia* and *Convolvuli*, *Hiptage*, *Plumbago*, eleven kinds of roses, *Jatropha*, various *Euphorbias*, *Crotons* and *Poincettia*, *Thujas*, *Abutilon*, and other *Hibisci*, *Cassia Fistula*, *Jasminum*, *Lagerstræmia*, *Buddlea*, *Clerodendrons*, and such like. Of what we should call hardy perennials, annuals, and bulbs, I saw *Maurandia*, *Lophospermum*, and *Thunbergias*, fine *Petunias*, *Sweet William*, *Mignonnette*, *Pelargoniums*, *Pentas carnea*, several *Aristolochias*, *Escholtzia*, *Lupines*, *Clarckia*, *Schizanthus*, *Balsams*, *Violets*, *Clematis*, *Cannæ*, *Strelitziæ*, and various *Marantaceæ*, numerous *Amaryllideæ* and *Lilies*, *Erysima*, *Iberis*, *Stocks* and *Wallflowers*; *Clerodendron*, *Nyctanthes*, and many species of *Vitex*. These form the bulk of the garden; many of them being the same as we have at home, others replacing our *Fuchsias*, *Rhododendrons*, *Azaleas*, *Andromedas*, and such-like natives of equally damp or temperate climates, to which the scorching sun at one season, or the periodical rains of the other, are inimical.

Numerous *Cerealia*, and the varieties of *Cotton*, *Sugar-cane*, &c. all thrive extremely well; so do many of our English vegetables. The cabbages are sadly hurt by the green caterpillars of a white *Pontia*;

and so are *Peas*, *Beans*, &c. *Strawberries* are now but in flower; and *Raspberries*, *Currants*, and *Gooseberries* will not grow at all.

The seed-room, a well-lighted and boarded apartment, measuring forty-six feet by twenty-four, is a model of what the arrangement of such buildings should be in this climate. The seeds are all deposited in dry bottles, carefully labelled, and hung in rows, round the apartment, to the walls; and for cleanliness and excellence of kind they would bear comparison with the best seedsman's drawers in London. Of English garden-vegetables and varieties of the Indian *Cerealia*, and *Leguminous* plants, *Indian corn*, *Millets*, *Rice*, &c., the collections for distribution were excellent; and I am promised samples of all these for Kew by my liberal friend Major Napleton, as well as other œconomic products of the district.

Altogether the Bhaugulpore Gardens are extremely good, and considering (which it is difficult to do) that they are not five years old, they reflect the greatest credit on the energy and perseverance of Major Napleton. The grounds are under the immediate superintendance of Mr. Ross, a gardener of some skill and knowledge, who was once attached to the Calcutta Botanic Gardens. In most respects the establishment is a model of what such institutions ought to be in India; not only of real practical value, in affording a good and cheap supply of the best culinary and other vegetables that the climate can produce, but as shewing to what departments such efforts are best directed. They diffuse a taste for the most healthy employments, and offer an elegant resource for the many unoccupied hours which the Englishman in India finds upon his hands. They are also schools of gardening; and a simple inspection of what has been done at Bhaugulpore is a long and valuable lesson to any person about to establish a private garden of his own.

I omitted to mention that the manufacture of œconomic products is not neglected. Excellent coffee is grown; and arrow-root, equal to the best West Indian, is prepared, at 1s. 6d. per bottle of twenty-four ounces,—about a fourth of the price of that article in Calcutta.

Another very interesting garden, though, of course, on a less pretending scale, is a private one belonging to Mr. Poutet, an enthusiastic horticulturist, and who has established many valuable plants from the Rajmahal hills, in his grounds. He has also a good collection of

minerals from the same hills, and is remarkably well-informed on many points of their Natural History.

A Himalayan blackberry (Raspberry, it is called here) was succeeding very well with him, by enclosing every fruiting raceme in a tin box, within which they ripened. As, however, I hope to return and visit the Rajmahals, possibly with Major Napleton and Mr. Pontet for my companions, I shall be able, at a future time, to give you more information about them.

BOTANICAL INFORMATION.

BOTANICAL SOCIETY OF LONDON.

Friday, 6th July, 1849.—E. Doubleday, Esq., V. P., in the chair, which was afterwards taken by J. Miers, Esq., V.P., F.R.S.—Mr. Jasper W. Rogers read a paper on the Uses and Properties of Peat Moss, and the value of Peat Charcoal as a disinfectant and fertiliser. The object of the paper was to shew the useful purposes to which the bogs of Ireland could be applied by the extraction of Peat from them and its conversion into Charcoal. The Charcoal extracted from the Irish Peat was far preferable to wood charcoal; and one of its greatest advantages was its effect as a disinfecting and deodorising agent; wood charcoal not possessing that property to nearly such an extent. It was, therefore, singular that now, when there is so much discussion about sanatory matters, an agent so powerful should have been overlooked. It was also valuable as a powerful absorbent, as it would absorb about eighty per cent. of water, and keep it for the benefit of the soil which might surround it, while it took up the greater portion of the obnoxious gases inherent in night-soil and sewage matter, and thereby neutralized any bad effect which might result from them. It was therefore capable of being converted into a manure of the greatest value, the proportions being two-thirds of night-soil to one-third of charcoal. It was impossible to find a better manure for the food of plants; for, containing a large quantity of carbon, it exhaled the ammonia and the salt which were in the night-soil—did not allow them to escape, but treasured them up, and in due time gave

them out for the sustenance of the plants placed under its influence. No better agent could be found for improving the sanatory condition of the metropolis. Were a proper system adopted, by means of this agent, the sewage matter of London could be converted into a source of great profit; while the bad effects, arising from the effluvia which emanated from such matter, would be got rid of. According to a calculation he had made, the matter so produced by a family of six would, in the course of a year, if subjected to the influence of this agent, yield £30 per annum; and supposing the cost of the charcoal, and other expenses, to amount to £15, which they could not exceed, there would still be a clear profit of £15 yearly. That might be doubted; but it was a fact which he had ascertained after the most careful consideration; and he had further ascertained, that were all the houses in London, which were rented at upwards of £10, to adopt that system, they would earn a profit of £15 per house, or three millions of money per annum. In order to effect that, they would have to collect the refuse from all these houses into one great cesspool, and then apply the agent in question. Were this done, it would be the best means of clearing the metropolis of that nuisance which now so much affects the health of its inhabitants; for, as matters now are, who could stand for an instant in the vicinity of one of those gratings in the street, without being sensibly affected by the effluvia which proceeded from it?—After some illustrations in proof of his statements, Mr. Rogers concluded by stating that he was about to give the public a proof of the truth of his theory by erecting an establishment for the purpose of carrying it out. He did not see the smallest difficulty in effecting it in the metropolis. At the present time ashes were collected from the houses for the benefit of the parish; and why should the inhabitants not give up the other refuse matter to the parish, upon a proper understanding? It was true no experiment had been as yet made on a large scale to test the truth of his theory; but the reason was, that charcoal could not be obtained on a large scale. He had been requested by the Guardians of the Poor at Macclesfield, some weeks ago, to try the experiment on a nuisance there; and although the charcoal was of a very inferior description, the peat having been obtained from a neighbouring morass, it had been eminently successful, and he had no doubt would be so in every case.

Another Coniferous Tree *detected in Australia, by* J. S. Bidwill, Esq.

Our readers are aware that Mr. Bidwill had the good fortune to detect a new Pine (*Araucaria Bidwilli*, Hook. in Lond. Journ. Bot., vol. 2, p. 48. Tab. 18, 19.) on the hills above Moreton Bay. Capt. Philip King, R. N., has favored us with an extract of a letter, written by the same gentlemen while travelling in N. W. Australia, at the River Mary, somewhere about S. Lat. 25° 25′ and Long. E. 152° 80′, dated Jan. 2nd, 1849; in which he describes the discovery of another Pine, the cones of which have fortunately reached us at the moment when this is going to press; and these, as far as can be judged without foliage, are the cones of the *Dammara orientalis* (a species hitherto noticed in the "mountains of the Molucca islands and of Java and Borneo"), or of some very nearly allied kind.

"I arrived here," writes Mr. Bidwill, "on the 30th December, after a journey of at least 280 miles from Brisbane. I lost one horse belonging to Government, owing to the stupidity and cowardice of my men, and wasted four days in looking for him unsuccessfully. Afterwards I gave sore backs to three horses of my own by being obliged to put his saddle upon them. I saw very little of interest, most of the journey being over wet and level land. In crossing the Brisbane range I found many of the plants first described in Sir T. Mitchell's last book, particularly great numbers of trees of his new *Bursaria*. The *Delabechia* is scarce everywhere, and I have not yet seen it, although I know of several places where it grows. I found a new sterculiaceous tree, with tetramerous flowers, a scarlet fruit in four carpels with large black seeds, the kernel is very good to eat. I first noticed it on Mount Brisbane, but it is common here. About forty miles from Brisbane I saw a solitary small plant of *Erythrina Vespertilio*, but no more until I entered my own district in the limestone country, where it is common on the open ground. A curious species of *Capparis* first made its appearance also the day I entered my territory. It is a small tree, with foliage resembling some of the Acacias, and growing sparingly over the forest land. The fruit is the size of a large pear, and is eaten by the natives, who say it is 'cobhan budgery.' I have one which I mean to try to-morrow, as it is beginning to emit a very pleasant smell. The name is Teru, or Teroom, or Taroom. I send you two fruits, which may perhaps be worth giving to the Museum at Kew, and

I shall forward specimens of the flower to Sir W. Hooker when I get them. I also put in fruit of two other edible *Capparideæ* : the round one is very common, and is also called Taroom : the oblong little one on the sprig is a climbing plant, and is called 'Mendameda.' Orchids are hardly to be seen in these bushes; but there is a pink terrestrial one now before the house, which I will send you to-morrow if I can; do not take it for a *Calanthe* because of its leaves. I also saw, about eighty miles from this, an apparently new one, which had fallen from a tree in a scrub; but I neglected to take it, thinking that I should be sure to get plenty here. I forget the name of the genus, but you may comfort yourself that the flower is one of the most insignificant of the tribe. There are hardly any fig-trees in these bushes; and, in fact, they are very poor compared to those at the Manning and Macleay.

"There is no Bunya (*Araucaria Bidwilli*) in my district: the only locality for it appears to be on the ranges at the head of the Brisbane, dividing that river from the heads of the Boyne or Burnett. Its habitat is, therefore, exceedingly limited, and in coming here I only saw five trees. I was told at one station, near which, on the surrounding ranges, these trees are numerous, that the weather was often there so cold in the winter that they had ice in the buckets an inch thick.

In 1842, when I was at Moreton Bay, looking for the Bunya, I met with a Wide Bay Black, who told me that that there was at that place another pine; not 'brother belonging to Bunya, but brother belonging toMoreton Bay Pine.' From that time to this I have made constant inquiries about this other pine; but (except Dr. Simpson, the C. C. at Moreton Bay) never again met with anybody who had seen or heard anything about it. Something, I do not know what, made me imagine that it was a *Dammara*; and I was surprised to find that Dr. Simpson had arrived at the same conclusion from comparing the description he had heard with the wood-cut of *Dammara*, in Loudon's Encyclopædia of Plants. Still, after all, I thought it might be nothing but *Podocarpus elata*, which *is* found at Moreton Bay. When I arrived here I inquired of everybody, particularly the sawyers and splitters, if there were two pines: they were unanimous in saying 'No.' I was almost disheartened, when yesterday (Jan. 1, 1849), in going up the river to sound, and look for the site of the future Maryborough, I espied a tree which did not look exactly like a pine, and yet was like one in some respects. I accordingly landed, and after mistaking a large *Flindersia* for my tree, and

being almost wearied with my search through the thick jungle, I saw a beautiful straight spar rising before me, covered with a smooth shining bark, very different from that of the Moreton Bay Pine, and to my great delight, as you may suppose, found under the tree several decayed cones, which settled the matter at once. It was too late to think of cutting down the tree, and I had no black-fellow with me to climb it. I therefore, after searching for seed and finding none, made up my mind to return to-day with a native to climb. This morning I found four of the trees opposite my house (hut); but the black-fellows said there were no cones upon them, and as I could see none I was obliged to go to the one first discovered, which was several miles up the river, and having a great many dispatches to write I was obliged to put off my visit until the afternoon. Meanwhile a black was shot by a man whom he had attempted to murder some time previously; and I could not induce any one to go with me, and was therefore obliged to cut the tree down. Strange to say, we could find but the single cone I now send you. The two fragments had lain under the tree, and will serve to figure the scales and seeds by. I do not think that this can be the season for fructification, as I could not detect a single perfect seed in any of the broken cones. I believe that the tree is common further down the river. It grows in rich sand or jungle land, with a trunk at the utmost three feet diameter, 150–170 feet high, very few branches. Bark smooth, shining, dropping off in scales. Wood, when fresh, very tough, yellowish. Native name *Tendara*, or *Tendarandara*.

Note on a diseased state of the leaves of Pleroma vimineum; by the Rev. M. J. Berkeley.

In the Gardeners' Chronicle, 1849, page 683, an account will be found of some fungoid bodies, which were observed in great abundance, on the pods of peas, by Dr. Dickie, near Aberdeen. They were supposed to be an hypertrophy of the cellular tissue; and I am confirmed in the view I then took by a very similar appearance presented by the leaves of a *Melastomaceous* plant (*Pleroma vimineum*, Don.) observed

by Mr. J. Smith in the great conservatory at Kew, much to the detriment of their beauty. The abundant hairs with which the leaves are clothed on both sides, especially the stouter ones upon the various ramifications of the nerves, are swollen at the base, and are composed of a number of cells, hexagonal below, but much elongated towards the apices, presenting very much the appearance of the leaves of some moss under the microscope. I have not been able to find this structure in *Melastomaceæ*, in any book to which I have access, though it can scarcely have escaped observation. In the affected leaves the base of the hairs swells, and at first remains green, the hair still occupying the centre of the swelling. As the swelling increases the hair is either thrown on one side or entirely disappears; while the little tubercles acquire a pale rusty hue, and are visible between the hairs, giving an unhealthy appearance to the leaves. They are of a tender consistence, swell out, after having been dried, very rapidly on the application of water, and consist of a very loose hexagonal tissue, with here and there a trace of slender threads. After a time they increase in size, projecting beyond the hairs, and present the appearance of some hypocreous *Sphæria*, or rather of some mangy eruption. They do not then so readily imbibe water. As the tubercles are smaller than those on the peas, they more readily dry, and therefore are not likely to pass into a state of decomposition, which may account for their not offering any extraneous bodies, such as existed in Dr. Dickie's specimens.—*M. J. B.*

NOTICES OF BOOKS.

Boissier: *Diagnoses Plantarum Orientalium Novarum.*

It is with much pleasure we announce the appearance of four more fascicles of this valuable work—Parts 8, 9, 10, 11, Paris, 1849, each of about 130 pages. In these portions the plants are arranged systematically, according to De Candolle, (from *Ranunculaceæ* to *Boragineæ*); and a very large proportion are from the collections made by the author himself, during his extensive travels; those of Heldreich, especially from Candia, &c., noticed in the present No. of the Journal; those of Aucher-Eloy, &c. The novelties in the genus *Astragalus* alone are

very great, occupying nearly seventy pages. We lament to learn that severe domestic calamity has for a time checked the zealous career of this talented author.

MIERS: *Illustrations of South American Plants.*

The 4th Part of this work has just appeared, with treatises on the genera *Nierembergia*, including nineteen species; *Vestia* (one species); *Nicobaria*, *Petunia* (eight species), among *Solaneæ*. These are followed by an account of a remarkable new genus, *Sclerophylax*, the type indeed of a new Order, from inter-tropical South America, La Plata; and, lastly, by an account of *Cyphocarpus*, a new Chilian genus, allied to *Campanulaceæ*, *Lobeliaceæ*, *Goodenoviaceæ*, *Cyphiaceæ*, and *Stylidiaceæ*, yet differing from all. The plates and copious dissections are no way inferior to the previous ones, and consist of Tab. 23, *Petunia parviflora;* Tab. 24, *Petunia ovalifolia*, and *Petunia elegans;* Tab. 25, *Sclerophylax spinescens;* Tab. 26, *Sclerophylax Arnottii* and *Gilliesii;* Tab. 27, *Cyphocarpus rigescens:* and 28 (of which the descriptions will appear in a following No.)—*Salpichroma hirsuta*, *S. tristis*, and *S. diffusa.*

GARDINER: *Twenty Lessons on British Mosses; second series, illustrated with twenty-five specimens.* Longmans, 1849.

We have noticed, with the praise it merits, the first series of this interesting and useful publication, so well calculated to encourage a taste for the study of the Mosses, and so well calculated also to give information on the subject of which it treats. We have, in the Introduction, the method described for collecting and preserving these beautiful objects, and then, in the first Lesson, an account of the Classification of Mosses, adopting that of the British Flora, as the most simple, with brief characters of the genera; and the two great divisions of the family *Acrocarpi* (fruit terminal), and *Pleurocarpi* (fruit lateral), are speakingly illustrated by a specimen at the head of each respective section; while the remaining "lessons" are each devoted to a genus and a full description of one or more species illustrated by specimens. We trust this little work will meet with the success it well deserves.

On the Structure of the PISTIL *in* ESCHSCHOLTZIA CALIFORNICA; *by the* Rev. J. S. HENSLOW, *Professor of Botany in the University of Cambridge.*

(Tab. X. A.)

A happy chance will sometimes favour the determination of a doubtful point, and enable us to prove more than the most ingenious speculations of the profound botanist. I was lately induced to re-consider the theory by which Dr. Lindley explains the structure of the pistil in *Eschscholtzia* and in *Cruciferæ*, from having met with a plant of *Eschscholtzia Californica*, whose flowers were apparently producing more than four stigmata. It will be remembered that Dr. Lindley (Bot. Reg. vol. 14. Pl. 1168) considers the pistil in this plant to be composed of four carpels; of which two are reduced to the condition of mere ovuliferous placentæ, each bearing a stigma; whilst the other two become non-placentiferous valves, also bearing stigmata even more largely developed than the others.

In order to trace the gradual development of the pistil, I began with flower-buds in very early stages, where this organ was not more than the hundredth part of an inch either in length or in breadth. Plate X.? fig. 1. is a pistil in this very early stage. It presents a laterally compressed pouch-like cellular mass, open above, with two nascent stigmata (S) at opposite ends. Upon opening it (Fig. 2.) there are not as yet to be seen any distinct traces of placentæ. In Fig. 3, 4, 5, are represented the successive developments which the margin of the open extremity of the pistil usually undergoes during the early stages of its growth, and up to a period when the placentæ and ovules have become distinctly formed. The two original stigmata (S) have been protruded to a considerable extent, and the two intermediate and smaller stigmata (t) have also made a marked progress. The real structure of these smaller stigmata is best seen in certain pistils where (Fig. 6 and 8) instead of a single lobe or prominence we find two such, indicating a tendency in the pistil to separate into two subordinate portions, and showing its structure to be really bicarpellary. Dissections of these pistils (Fig. 7 and 9) show the mode in which the placentæ (p) originate. Each begins to develope as a double ridge of swollen tissue, contiguous to the sutural line which defines the limits of the rudimentary and combined carpels, and running from the base to the apex.

Here these ridges diverge, and become blended with the incipient swellings of that portion of the tissue which ultimately becomes stigmatic tissue, and runs along the entire margin of the pouch-shaped pistil. There is therefore, strictly speaking, a three-lobed stigma crowning each carpel, of which one lobe (S) is at the apex terminating the mid-rib, and the others (t) immediately above the upper extremities of their combined margins. The contiguous lobes (t) of the combined carpels become so intimately united, that they usually develope as simple stigmata, which appear like prolongations of the placentæ. They are, however, compound; and thus are analogous in position and condition to the stigmatic lobes or rays in *Meconopsis*, *Papaver*, &c. This compound character of these smaller stigmata may be traced, even where the union of the two lobes is complete, by a faintly depressed line running longitudinally down their inner surface. As the pistil continues to grow, its orifice becomes choked with stigmatic tissue; whilst the stigmatic lobes, (both S and t) are further developed into long cylindric branches. The connection between each of the two longest branches (the presumed abortive stigmata of Lindley) and the two placentæ, is well marked by the deep orange tissue that descends immediately from its base, separating into two streams, one of which proceeds to each placenta in the ordinary manner. Some late flowers of diminutive size were entirely without the two smaller branches of the stigmata; and then the pistil presented the appearance of bearing two stigmata only, alternating with the placentæ! (Fig. 10.) In the peculiarly constructed specimens, to which I alluded in the commencement of this paper, it has become sufficiently evident that their apparently numerous stigmata were nothing more than so many branches or extensions from a common mass of stigmatic tissue. I have represented two of these modifications as they would appear when flattened out,—the eye looking down vertically upon them (Fig. 11 and 12.) The line of demarcation between the outer or under, and the upper or inner, surfaces of the carpels, is distinctly marked by the green tint of the former and the orange colour assumed by those portions of the latter which have passed to the condition of stigmatic tissue. The four elongated lobes or branches, usually considered to be distinct stigmata, consist mainly of stigmatic tissue only; though the green tissue of the outer surface does extend (see Fig. 10) a little way up them, and stretches round their base, connecting one with the other, in the manner shewn Fig. 11.

In very early stages of the pistil of *Glaucium*, I observe precisely the same structure as in *Eschscholtzia;* and we have only to suppose the stigmatic lobes of the latter to be contracted and confluent, and a pistil like that of the former is the result. Dr. Lindley has noticed that *Chelidonium* and *Hypecoum* exhibit a tendency to extend the apex of the peduncle; and I observe that in *Glaucium* such a tendency strikingly resembles what takes place in *Eschscholtzia*, though it is not carried to the same extent. In *Glaucium*, again, the sepals detach themselves as readily round the base as in *Eschscholtzia;* and I have found a plant of the latter, where the sepals constantly became separated at their margins, whilst one of them remained attached by the base to the pedicel. In this case the more persistent sepal had a tendency to assume a foliaceous character with marginal incisions. The conditions presented by the stigmata of these bi-carpellary genera require only slight modifications to assume the conditions presented by the stigmata of multicarpellary genera of the same order.

On a FUNGOID GALL, *from Pará*; *by the* Rev. M. J. BERKELEY, M. A., F.L.S.

(Tab. X. B.)

Some years since a notice was published in the Transactions of the Linnæan Society, (vol. xviii. p. 575., Tab. 39. A.), respecting a Gall produced on the leaf of some Ochnad from South America, and communicated by Mr. Macleay. Two or three analogous productions have since that period been submitted to me from their striking resemblance to Fungi; but none so remarkable as the subject of the present note, which was gathered in Pará, by Capt. Sir Everard Home, R. N., in 1836. Like other analogous forms, it occurs indifferently on the upper or under side of the leaf, bursting through the cuticle, and appearing under the form of a stipitate cup a quarter of an inch long, and at first furnished with a convex lid, which at length falls off, leaving the edge of the cup perfectly even; the whole resembling very closely a large *Craterium*. The cup splits on very slight pressure longitudinally; but this is probably not the case when fresh. No information was communicated as to the nature of the insect by which it was produced; indeed it was supposed to be a parasitic fungus. There is a little black disc

on the side of the leaf opposite to that on which the gall breaks forth, corresponding with the insertion of the stem. Almost every specimen is beset with a minute parasitic fungus, which appears to be undescribed. It may be thus characterized :—

Sphæronema *epicecidium*, n. s. peritheciis minutis innatis nigris ore prominulis; sporidiis variis plus minus obovatis minimis.

Tab. X. B. Our plate shews (Fig. 1.) the gall of the natural size, and a magnified view (Fig. 2) as it is infested with the parasite. Fig. 3. the perithecia, as seen from above, springing from an obscure stratum of flocci, which are more or less confused with the outer cells of the gall, beneath which the larger cells of the subjacent tissue are visible. Fig. 4. spores highly magnified.

CHARACEÆ INDIÆ ORIENTALIS ET INSULARUM MARIS PACIFICI; *or characters and observations on the* CHARACEÆ *of the East Indian Continent, Ceylon, Sunda Islands, Marians, and Sandwich Islands; by* DR. ALEXANDER BRAUN.

The East Indian *Characeæ* are far less peculiar than those of Australia, the greater part of them being found also in other parts of the world, although exhibiting different varieties. It is remarkable that several of the East Indian species agree with those of South America and the warmer parts of North America. In treating the single species I shall specify these relations. In this enumeration of the East Indian *Characeæ*, the herbarium of Sir W. Hooker has furnished me with the richest materials; but I regret not having found in it the species enumerated in Dr. Wallich's Catalogue. Other valuable additions were furnished to me by *Agardh*, *Meyen*, *Bellanger*, *Perrottet*, &c. doubts concerning the synonymy cannot yet be cleared up; but I hop that the communication of these remarks will give to others the opportunity of removing them.

Genus I. NITELLA.

Subgenus A. NITELLA.

a, *Nitellæ furcatæ*.

d, *homophyllæ*.

1. *N. acuminata, var. Bellangeri;* monoica, robustior, flexilis; verticillis e foliis 6–8, sterilibus remotissimis e foliis elongatis, nonnisi

apice brevissime 3–4-furcatis, segmentis mucroniformibus longe et acutissime acuminatis; verticillis fertilibus in capitula congestis, e foliis abbreviatis, supra medium vel medio simpliciter furcatis, segmentis ventricosis longe et acutissime acuminatis; seminibus aggregatis subglobosis, coronula brevissima obtusa, fasciis 6–17.

Ch. *Bellangeri* A. Br. in lit.

In pools near *Gengu* on the coast of Coromandel, collected by Bellanger in 1826–28, growing in company with *Chara coronata*, var. *Coromandelina.*

This species resembles, in size and habit, *Nitella translucens*, being however entirely different from it in its only one-celled segments of the leaves, and in reality much nearer *N. flexilis.* The fructiferous heads are larger and less dense than in *N. translucens.* The nut of the seed is yellow-brown, and $\frac{28\text{-}30}{100}$ m. long.

Another variety of this species is found in Missouri and Texas (*N. acuminata* var. *Lindheimeri*) and a third in the Isle de France (*N. acuminata* var. *Mauritiana*).

b, *Nitellæ mucronatæ.*

d, *homophyllæ.*

2. *N. Roxburghii*, monoica, robustior, firmior et minus pellucida; verticillis e foliis 6, inferioribus remotis in medio simpliciter multifurcatis, segmentis mucrone imposito acutissimo (demum deciduo) apiculatis; verticillis superioribus sensim decrescentibus et in capitula majora congestis, e foliis duplicato- tandem triplicato-divisis, segmentis ultimis abbreviatis mucroniformibus bicellularibus, cellula inferiore ventricosa, superiore angustata et acutissima; seminibus in prima et secunda foliorum divisione sæpe aggregatis, subglobosis, coronula elongata angustissima, fasciis 5–6.

Chara furcata Roxb.? (non *Ch. furcata*, Amici).

On the coast of Coromandel, near Madras, Dr. Wight, No. 135 et 136 in herb. Hook.

A species of considerable size and distinguished characters, which seems to be peculiar to the East Indies. I am unable to decide if this is the *Chara furcata* of Roxbourgh,—specimens of the coast of Coromandel and the *Flora Indica* not being in my possession. In Sir. W. Hooker's herbarium there is, under the name of *Ch. furcata* Roxb., a plant from Mr. Jenkins, gathered in Assam, which, although in habit it has a deceptive resemblance to a *Chara*, belongs to the Phanerogamic

plants. It possesses an articulated stem, with whorls, each of ten leaves, which are very narrowly spathulate, in the upper part deeply pinnatifid with three pairs of linear segments, of which the inferior ones are the longer, and sometimes once more divided in the outside. As there are no flowers I am unable to come to a more accurate determination of this plant. In several other collections I have found, under the name of *Ch. furcata*, specimens of *Ch. corallina*, distributed by Hornemann.

3. *N.* (*exilis* var. ?) *flagelliformis*, monoica; tenuis, flexilis et pellucida; verticillis omnibus laxis e foliis 5–6 duplicato- vel in radiis nonnullis triplicato-divisis, articulo primario valde elongato, segmentis divisionum insequentium sensim brevioribus, ultimis mucrone imposito angusto acuto apiculatis; seminibus solitariis oblongis, coronula brevi, nucleo acutangulo, fasciis 9–8.

I have seen of this species only some fragments adhering accidentally to *Chara corallina*, communicated by Hornemann under the name of *Ch. furcata*. It resembles most nearly N. *gracilis* (Ch. gracilis, *Smith*) and N. *exilis* (Ch. exilis, *Amici*, Ch. flabellata, *Reichenb.*), according with the latter in the size of the seeds, but differing somewhat by the greater elongation of the first joint of the leaves, and by seeds with still sharper angles on the nut. Length of the nut $\frac{30\text{-}31}{100}$ m.

4. *N. byssoides*, monoica, minima, flexilis et pellucida, dense et intricatim cæspitosa; verticillis densioribus e foliis 6 breviusculis, medio divisis, uno alterove radio iterum diviso, segmentis ultimis mucrone imposito minutissimo acuto apiculatis; seminibus solitariis subglobosis, coronula brevi obtusa nuclei gyris non prominulis, fasciis 6–7.

On the coast of Coromandel, collected by *Bellanger* (1826–28).

This species requires future researches to ascertain whether it must be left as such, or united with *N. tenuissima*, as the smallest variety of it. It differs, however, by its exceedingly minute size, its leaves only twice divided, its whorls less compact, and still smaller seeds. The yellow-brown nut of the seed is only $\frac{19}{100}$ m. long.

Genus II. CHARA.

Subgenus B. CHARA.

a, *Charæ haplostephanæ.*

a, ecorticatæ.

5. *Ch. corallina*, monoica, validior, flexilis et pellucida, omnino ecorti-

cata; verticillorum foliis 6, articulis 4–5, elongatis, ultimo mucroniformi angusto et acutissimo; stipulis ad basin verticilli inconspicuuis; foliolis ad genicula foliorum minimis acutissimis erectis; antheridiis et seminibus in geniculis foliorum solitariis et insuper in fundo verticilli aggregatis; seminum fasciis 7.

Ch. corallina, *Klein ap. Willd. in Act. Acad. Berol.* 1801-2. *p.* 61. *t.* 2. *f.* 2 (*icon pessima*) *et Sp. pl.* 4. 186.

Ch. Roxburghii, *A. Br. in Regensb. bot. Zeit.* 1835. *p.* 59.

Nitella *corallina, Ag. Syst. Alg. p.* 123.

Willdenow gives *Malabar* as its native country, but on the paper of Klein, in Willdenow's herbary, is written "*Frankenb.* 1799," which signifies doubtless *Tranquebar* on the coast of Coromandel. In Sir W. Hooker's herbarium are specimens from *Madras* (*Dr. Wight*, No. 137). In the herbaria of Desfontaines, Agardh, and others, I have seen specimens distributed by Hornemann under the name of *Ch. furcata*, Roxb., without indication of the locality.

A very remarkable species, peculiar to the East Indies, in size resembling *Nitella translucens*, somewhat thinner than the nearest related *Ch. australis*. It is without annular incrustation, as is seen sometimes in *Nitella syncarpa*. The name refers to the coral-red colour of the antheridia, and perhaps also the unripe seeds: the ripe seeds, however, have a black nut without calcareous covering, and are considerably larger than in the following species.

6. *Ch. coronata*, monoica, debilior, flexilis et pellucida, omnino ecorticata; verticillorum foliis 8–10, articulis 4–6, ultimo mucroniformi; stipulis numero foliorum iisque oppositis, coronam ad basin verticilli simplicem conspicuam formantibus; foliolis in omnibus foliorum geniculis verticillatis, iis geniculi ultimi apicem folii una cum mucrone terminali coronantibus; anterioribus longioribus semina subæquantibus vel superantibus, posterioribus brevioribus vel omnino depauperatiś; seminibus in geniculis foliorum solitariis vel rarius geminatis, in fundo verticilli nullis.

Ch. coronata (*Ziz. ined.*) *A. Br. in Regensb. bot. Zeit.* 1835. *p.* 59.

α. Coromandelina, major; foliis verticillorum circiter 10, articulis 5 (elongatis 4); stipulis et foliolis inflatis acuminatis, longitudine seminum; seminibus solitariis ovatis majoribus, coronula brevi papillis obtusis, fasciis 8.

β. orientalis, minor; foliis verticillorum circiter 8, articulis 4 (elongatis

3); stipulis foliolisque angustis longitudine fere seminum; seminibus solitariis oblongis majusculis, coronula elongata papillis attenuatis acutiusculis erectis, fasciis 11–12.

Ch. eremosperma, *Ruprecht, Beitrage zur Pflanzenkunde des Russischen Reichs, 3 Lief. p.* 12.

γ. *Oahuensis*, gracilior; verticillorum foliis circiter 8; articulis 5–6 (elongatis 4–5); stipulis et foliolis angustissimis et acutissimis, longitudine fere seminum; seminibus solitariis oblongo-cylindraceis majusculis, coronula elongata papillis valde attenuatis divaricatis, fasciis 11–12.

Ch. Oahuensis, *Meyen, Reise um die Erde II. p.* 11.

The variety *a* was collected near Gengu on the coast of Coromandel by *Bellanger*, in 1826–28 (Herbier de l'Inde, No. 94); the var. *β* in Java, by *Sporleder* (herb. Kunze), in Japan, by *Göring*, and in Songaria (*Ruprecht*); the var. γ. on the Sandwich Islands, Oahu, by *Meyen*, in 1831.

Ch. coronata is one of the most variable species, and dispersed over a great part of the earth. The common variety in Europe is Ch. *Braunii* Gmel. Fl. Bad. (Ch. flexilis, Corti and Amici), distinguished from the varieties here described by the smaller seeds, which are sometimes geminated. Another variety, with very short foliola, was found in Corsica (var. *Soleirolii*); others in Algeria (var. *Atlantica*), Senegambia (var. *Perottetii*), and in North America (var. *Schweinitzii*). In all the varieties the nut of the seed is black, wanting a calcareous covering; in the European $\frac{40-48}{100}$ m.; in the East Indian varieties $\frac{60-75}{100}$ m. long.

β, corticatæ.

** gymnophyllæ.*

7. *Ch. flaccida*, monoica, flexilis et diaphana; caule tenui corticato, aculeis raris sparsis papilliformibus vel conico-elongatis; verticillorum foliis 10–12, omnino ecorticatis, ex articulis 4–5, ultimo breviore foliola geniculi supremi paulo superante; foliolis in omnibus foliorum geniculis verticillatis, omnibus elongatis, quam semina subtriplo longioribus; stipulis duplici foliorum numero, longitudine foliolorum, coronam simplicem valde conspicuam patulam formantibus; seminibus solitariis vel geminatis, minutis, coronula brevi, nucleo fuscoluteo, fasciis 9–11.

a, *Wightii*, aculeis caulis conspicuis; foliorum articulis 5; seminibus sæpius geminatis, fasciis 10–11.

Ch. Hydropitys var. flaccida, *A. Br. in lit.*

β. *Gaudichaudii*, verticillis remotissimis; aculeis minimis inconspicuis; foliorum articulis 4; seminibus solitariis, fasciis 9.

Ch. fibrosa, *Ag. Syst. Alg. p.* 129.

The var. *a.* was found near Madras by *Dr. Wight* (No. 133 in herb. Hook.); β in the Marian Islands, by *Gaudichaud* (herb. Agardh).

Ch. flaccida is very nearly allied to the subsequent species, differing, however, by the larger and less contorted seeds with a yellow-brown nut. The naked (uncovered and therefore not striated) leaves are of less importance, *Ch. Hydropitys* varying also sometimes with naked leaves.

** *gymnopodes.*

8. *Ch. Hydropitys*, monoica, subflexilis et subdiaphana, caule tenui corticato, aculeis raris sparsis conicis parum elongatis; verticillorum foliis 10–12, articulis 5–7, primo (sequentibus æquilongo) semper ecorticato, sequentium uno vel pluribus corticatis, ultimo breviore attenuato foliola geniculi supremi paulatim superante; foliolis in omnibus foliorum geniculis verticillatis, longitudine subæqualibus, quam semina subduplo longioribus; stipulis duplici foliorum numero, longitudine foliolorum, coronam simplicem conspicuam subpatulam formantibus; seminibus solitaris perminutis, coronula brevi obtusa, nucleo atro, fasciis 11–13.

Ch. Hydropitys, *Reichenb. in Mossl. Elandb. ed. III. p.* 1669 *in nota.*

Ch. longibracteata, *Salzm. herb.*

var. *Indica*, aculeis quam in varietate Americana magis conspicuis; seminibus paulo minoribus, fasciis 11 (in *Americana* 13).

a. *major* (palmaris—pedalis.)

b. *minor* (2–3 pollicaris.)

Ch. *Chamæpitys*, A. Br. in lit.

c. *gymnophylla*, articulis foliorum omnibus ecorticatis.

On the coast of *Coromandel* in company with *Ch. Ceylonica* Willd. (*Belanger* in 1826–28 var. 6.); *Jenkins* in Assam (herb. Hook., var. a. and passing into var. b.); *Busna* (herb. Hook. a. and c. mixt).

One of the prettiest species of the genus, which seems to be equally frequent in the East Indies and South America. The first specimens which I received from the East Indies by Bellanger were so exceedingly small, in comparison with those from Surinam and the Brazils, that I was led to distinguish them as a particular species; but the rich series of this species, in Sir W. Hooker's herbarium, convinced me

afterwards, that there is no essential difference between the East Indian and American variety. The form with naked leaves from Busna can not be regarded as a peculiar variety, since there are sometimes in the same specimen covered and uncovered leaves. The length of the seed-nut is in the East Indian variety $\frac{33-36}{100}$; in the American $\frac{36-40}{100}$ m.

b, *Charæ diplostephanæ.*

γ, *corticatæ diplostichæ.*

9. *Ch. fœtida.*

A. Br. in Regensb. bot. Zeit. 1835. p. 63.

Ch. vulgaris, *Engl. Bot.; Wallr.; Agard et c.* (*non Lin.*)

Of this most common and widely dispersed of all species, I found, in Sir W. Hooker's herbarium, a specimen collected by *Dr. Wallich* in Nepal.

d, *corticatæ triplostichæ.*

* *phlœopodes.*

10. *Ch. brachypus*, monoica, tenuiter incrustata, fragilis; caule seriebus tabulorum numero foliorum triplis corticato, aculeis minutis acutis sparsis armato; foliis verticillorum 10–12, articulis 8–10, præter ultimum mucroniforme omnibus corticatis; infimo sequentibus triplo breviore et subhyalino; foliolis in geniculis fertilibus unilateralibus (posterioribus nempe abortu minimis et inconspicuis) angustissimus, semina longitudine non aut vix æquantibus, in geniculis superioribus (abortu) omnino deficientibus; stipulis coronam duplicem formantibus, seriei superioris elongatis foliorum articulum infimum tegentibus, serici inferioris abbreviatis et cauli retrorsum adpressis; seminibus ovalibus; coronula brevi erecta, fasciis 12–13.

Ch. setosa, *Klein ap. Willd. in Act. Acad. Berol.* 1801–2, *p.* 58. (*ex parte*) *t. I. f.* 1. (*male*) *et Sp. pl.* 4. *p.* 184.

Var. β. *gracilescens*, aculeis inconspicuis; foliis verticillorum 8–9; stipulis articulum foliorum infimum subcoloratum non omnino tegentibus; seminibus minoribus.

Tranquebar (*Klein*, 1799 in herb. Willd.); Madras (*Graham* in herb. Agardh, *Dr. Wight*, No. 130 and 132 in herb. Hook.) The variety was collected near Madras by *Dr. Wight* (No. 134 in herb. Hook.)

The normal form is peculiar to the East Indies; but a variety, almost entirely agreeing with the var. β *gracilescens*, is also a native of Egypt and Cordofan. In size and colour this species resembles much *Ch. fragilis* Desv. (pulchella, *Wallr.*), differing, however, from it by very important characters; among which the shortness of the first joint of the leaves, which is uncovered and hidden beneath the stipulæ, is the

most remarkable. This first joint bears already fructification; whereby it appears as if there was a circle of seeds and antheridia in the ground of the whorl. Another difference, important but difficult to observe, consists in the construction of the covering of the leaves. In *Ch. fragilis* the number of series of covering cells is double that of the foliola; in *Ch. brachypus* triple, which is accompanied in the latter species by a finer striation of the leaves. In this character *Ch. brachypus* agrees with *Ch. polyphylla*, which in many forms indeed is deceivingly near it. But in *Ch. polyphylla* the first joint of the leaf is not only uncoloured, but also uncovered, and therefore not striated.

Concerning the name, I have not adopted that of *setosa*, not only because it is unsuited, but also because even the authors of it did not know exactly their own species, and confounded them with *Ch. polyphylla*, var. *Ceylonica*, as can be seen by comparing Willdenow's herbarium. The paper of Klein, containing at the same time a diagnosis, shows that Klein called his new species *Ch. setigera* (not *setosa*), a name which refers to the narrow bracteæ surrounding the seeds. "Flores fœm. setis 4, flore longioribus obvallati." But these bracteæ in *Ch. brachypus* are somewhat shorter than the seed, or, at the most, of the same length, while they generally are longer in *Ch. Ceylonica*. This indicates a confusion of both species, which is confirmed by comparing the specimens communicated by Klein to Willdenow. The specimens of both species are now and then infested by young *Confervæ*, which Willdenow regarded as hairs belonging to the plant. Therefore he says, in his diagnosis, "ramulis apice subpilosis." These hairs are also represented by him in his figure of *Ch. brachypus*.

The length of the whole seed of *Ch. brachypus* is $\frac{85-90}{100}$ m.; that of the nut $\frac{63-66}{100}$.

** *gymnopodes.*

11. *Ch. polyphylla*, monoica, plus minusve incrustata; caule seriebus tubulorum numero foliorum triplis corticato, aculeis angustis acutis armato; foliis verticillorum 8–15, articulis 8–13, infimo brevissimo ecorticato hyalino, sequentibus corticatis, ultimo brevissimo ecorticato mucronem terminalem formante, rarius pluribus superioribus ecorticatis; foliolis in omnibus geniculis verticillatis, anterioribus longioribus plerumque semina superantibus; stipulis coronam duplicem formantibus, seriei superioris longioribus foliorum articulum infimum

tegentibus; seminibus ovatis vel oblongis, coronula breviuscula lata papillis subdivaricatis, fasciis 14–15.

Ch. polyphylla, *A. Br. in. Regensb. bot. Zeit.* 1835. *p.* 70. (*sed nunc sensu latiori.*)

α. Ceylonica, rigidior et nitidior; aculeis sparsis; foliis verticillorum 10–12, articulis 9–12, geniculo foliorum infimo sterili; seminibus majoribus.

Ch. Zeylanica, *Klein ap. Willd. in Act. Acad. Berol.* 1801–2, *p.* 59. *t. II. f.* 1. *et Sp. pl.* 4. *p.* 184.

a, *longibracteata*, aculeis, stipulis, foliolisque longioribus; foliolis anterioribus quam semina sesqui- vel duplo longioribus.

b, *brevibracteata*, aculeis, stipulis et foliolis brevioribus, foliolis anterioribus semina vix æquantibus.

c, *brachyphylla*, foliis brevioribus incurvis, foliolis semina vix æquantibus.

d, *gymnoteles*, articulis foliorun superioribus nonnullis ecorticatis.

β. Meyenii, flexibilior et subdiaphana; aculeis subverticillatis; foliis verticillorum 10–13, articulis 8–10, geniculo infimo fertili, foliolis semina visa superantibus; seminibus minoribus.

Ch. armata, *Meyen, Reise um die Erde II. p.* 11.

Variat. b. *paragymnophylla*, articulis superioribus pluribus, nonnunquam articulis omnibus ecorticatis.

Ch. armata *β*. diaphana, *Meyen l. c.*

The variety *α*. was first detected in Ceylon by *Lebeck*, in 1798 (according to Klein in herb. Willd.) and afterwards collected near Tranquebar (*Klein* in herb. Willd.); Gengu (*Belanger*); Madras (*Graham* in herb. Agardh; *Dr. Wight* in herb. Hook. No. 131, 139, 152); Pondicherry (*Perrottet*); Busna (with *Ch. Hydropithys*, herb. Hook.); the variety *α*. d. near Madras (*Dr. Wight* in herb. Hook.) The var. *β*. was collected by *Meyen* in 1831 on the Sandwich Island, Oahu; *β*. b. in the same Island by *Meyen* and also by *Eschscholtz*.

The seeds of *α*. are $\frac{96-102}{100}$ m. long (the nut $\frac{57-60}{100}$); the seeds of *β*. about $\frac{80}{100}$ m.

To the varieties of *Ch. polyphylla* here described, several others are to be added, natives of North America, the West Indies, and South America. To these belong *Ch. foliolosa* Mühlenb. ap. Willd. from North America; *Ch. Indica* Bertero, from Guadeloupe; *Ch. Haitensis* Turpin, from St. Domingo; *Ch. compressa* Kunth, from Venezuela. All these must be considered varieties of *Ch. polyphylla*.

12. *Ch. Javanica*. I cannot exactly define this species, having seen

only a single specimen in Delessert's herbarium, marked Java, *La Haye*. At all events it approaches *Ch. polyphylla*, seeming, however, to have a more simple covering of the leaves, in the manner of *Ch. fragilis*. It is tender and pellucid, imperceptibly incrustated; the first uncovered joint of the leaves is not quite hidden by the short stipulæ; the foliola are shorter than the seed, which is somewhat less than in *Ch. Ceylonica*, having a short coronula and only 11–12 striæ on the side.

East Indian species unknown to me:—

Ch. polyclados Don. (ubinam descripta?)
Ch. spiralis herb. Hamilt. (Wallich Cat. 5188).
Ch. hispida herb. Madr. (Wallich Cat. 8189).

Freiburg, Grand Duchy of Baden, March, 1849.

Extracts from the Private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

(*Continued from p.* 282.)

Calcutta to Darjeeling in Sikkim-Himalaya.

From Bhaugulpore I despatched my Soane valley, Birbhoom, and Behar, &c. collections to Calcutta, for transmission, through Dr. Falconer's kindness, to England. The packing of them, with frequent visits to the Horticultural and Mr. Pontet's gardens, occupied all my time. I staid with Dr. Grant, and passed five days at this most pleasant station, making many acquaintances amongst the residents, from whom I received the usual Indian hospitality.

I took, as it were, a new departure, on Saturday, April the 8th, my Dawk being laid on that day from Caragola Ghat, about thirty miles down the river, for the foot of the Himalaya range and Darjeeling. Dr. Grant accompanied me to Colgong, half way down the river, on my course, where we proposed lunching, before I should proceed. Having dismissed the huge boat which I had hired at Mirzapore, I embarked in a much swifter one, kindly lent me by the magistrate of Bhaugulpore, in which we had no sooner set forth than a heavy easterly gale

sprung up, against which the boat was slowly tracked, albeit with a favoring current of some four or five miles.

Passing the pretty villa-like houses of the English residents, the river-banks re-assumed their wonted features: the hills receded from the shore; and steep clay cliffs, twenty to fifty feet high, on one side, opposed long sandy shelves on the other. Kunker was still most abundant, especially in the lower bed of the banks, close to the (now very low) water. The strata containing it were much undulated, but not uniformly so; horizontal layers over- or under-lying the disturbed ones. At Colgong, conical hills again appear, of rocks similar to those of the mountains behind Bhaugulpore and Monghyr; and two remarkable sister-rocks start out of the river, the same in structure and dip with those of Sultangunje. A boisterous current swirls round them, strong even at this season, and very dangerous in the rains, when the swollen river is twenty-eight to forty feet deeper than now. We landed opposite the rocks, and proceeded to the residence of G. Barnes, Esq., prettily situated on one of the conical elevations characteristic of the geology of the district. The village we passed through had been recently destroyed by fire; and nothing but the clay outer walls and curious-looking partition walls remained, often white-washed and daubed with figures in red of the palm, elephant, peacock, and tiger,—a sort of rude fresco painting. We did not arrive till past mid-day, and the boat, with my palkee and servant, not having been able to face the gale, I was detained till the middle of the following day. Mr. Barnes and his brother proved most agreeable companions,—very luckily for me, for it requires no ordinary philosophy to bear being storm-stayed on a voyage, with the prospect of paying a heavy demurrage for detaining the Dawk, and the worst one of finding the bearers given to another traveller when you arrive at the rendezvous. The view from Mr. Barnes' house is very fine: it commands the river and its rocks; the Rajmahal hills to the east and south; broad acres of Indigo and other crops below; long lines of Palm-trees, and groves of Mango, Banana, Tamarind, and other tropical trees, scattered close around and in the distance. In the rainy season, and especially immediately after, the snowy Himalaya are distinctly projected on the horizon, fully 170 miles off. Nearly opposite, the Cosi river enters the Ganges, bearing (considering its short course) an enormous volume of water, the drainage of the whole Himalaya, between the two giant

peaks of Kinchinjunga in Sikkim, and Gossain-Than in Nepal. Even at this season, looking from Mr. Barnes' eyrie over the bed of the Ganges, the enormous expanses of sand, the numerous shifting islets, and the long spits, betray the proximity of some very restless and resistless power. During the rains, the scene must indeed be extraordinary, when the Cosi lays many miles of land under water, and wafts so vast a quantity of detritus into the bed of the Ganges that long islets are heaped up and swept away in a few hours; and the latter river becomes so wild as to be all but unnavigable. Boats are caught in whirlpools, formed without a moment's warning, and sunk ere they have spun round thrice in the eddies; and no part of the inland navigation of India is so dreaded or dangerous, as the Ganges at its junction with the Cosi.

Rain generally falls in these districts in partial showers at this season, and they are essential to the well-being of the spring crops of Indigo. The stormy appearance of the sky, though it proved fallacious, was hailed by my hosts as apparently predicting a fall, which is most grievously wanted. It seems, at present, only to aggravate the drought by the great body of sand it lifts and sweeps up the valleys, obscuring the near horizon, and especially concealing the whole broad delta of the Cosi, where the raised masses are so vast and dense, and ascend so high, as to resemble another element.

All night the hard-hearted gale blew on, accompanied with much thunder and lightning, and it was not till noon of the 9th that I descried my Palkee boat toiling down the stream. Then I again embarked, taking the lagging boat in tow of my own. Passing the mouths of the Cosi, the gale and currents were so adverse that we had to bring up on the sand-banks, when the quantity which drifted into the boat rendered the delay as disagreeable as it was tedious. The particles penetrated everywhere, up my nose and down my back, drying my eye-lids, and gritting between my teeth. The craft kept bump, bump, on the banks, and being both crazy and leaky, the little comfortless cabin became the refuge of scared rats and cockroaches. In the evening I shared a meal with these creatures, on some provisions my kind friends had put into the boat; but the food was so sandy that I had to bolt my supper!

At night the storm lulled a little, and I proceeded to Caragola Ghat and took up my Dawk, which had been twenty-eight hours expecting me,

and was waiting, in despair of my arrival, for another gentleman on the opposite bank, who could however not get across the stream, to my great comfort.

At nine the following morning my Palkee was set down at Mr. Griffith's door in Purneah, thirty miles from Caragola Ghat. He is the Civil Surgeon and Post-master, and from him I received a kind invitation to breakfast, and to pass the day; but my anxiety to reach the hills urged me on at noon for Kishengunge. The whole country, since leaving Caragola, wears a greener garb than I had seen anywhere south of the Ganges: the climate is evidently more humid, and has been gradually becoming so from Mirzapore. The first decided change was a few miles below the Soane mouth, at Dinapore and Patna; and the few hygrometrical observations I took at Bhaugulpore confirmed the much further increase of moisture. The proximity to the sea and great Delta of the Ganges sufficiently accounts for this; as does the approach to the hills for the still greater dampness and brighter verdure of Purneah. I was right glad to feel myself within the influence of the long looked-for Himalaya; and I narrowly watched every change in the character of the vegetation. A Fern, growing by the road-side, was the first and most tangible evidence of this; together with the absence of *Butea*, *Boswellia*, *Catechu*, *Grislea*, *Carissa*, and all the companions of my former trips, but most especially of the *Zizyphi*.

Purneah is a large station, and considered very unhealthy during and after the rains. From it the road passed through some pretty lanes, with large trees of *Eriodendron*, groves of planted *Guava* and *Annona* bushes, a few *Phœnix* palms, and a *Calamus*, the first I had seen. Though no hills are nearer than the Himalaya, the road undulates remarkably for this part of India; and a jungly vegetation ensues, consisting of the above plants, with the yellow-flowered *Opuntia* re-placing the *Euphorbias*, which were hitherto much more common. *Odina* and *Spondias* are new to me in such profusion, and so is the cultivated *Tahenæmontana?* or *Plumiera*, which scents the air. *Acacia Arabica* is very rare; so is *Argemone*. I observed no Castor-oil nor *Calotropis*. Though still 100 miles distant from the hills, mosses appear on the banks, and more Ferns are just sprouting above ground. Birds and butterflies are numerous.

The *Bamboo* is a very different species from any I have hitherto met with, and it forms groves of straight trees some fifteen to twenty feet high, thin of foliage, with a narrow erect coma, not unlike poplars. The

branches are also rarely erect, and do not feather out from the plant. Its stems are not shiny, and I believe they are solid. I was fortunate in detecting a little of the flower, which is borne in a plain slender panicle, very unlike the knotty tufts of the common Behar species. Leaving these groves, the country again becomes open and grassy, with very little cultivation and all pasturage. Palms appear to cease altogether: I can scarce tell why.

At night we had heavy rain and a violent thunder-storm. The road crosses many small streams by ferries of flat-bottomed boats.

Thirty-six miles from Purneah brought me, at 5 a.m., to Kishengunje, when I found that no arrangements whatever had been made for my dawk, and I was fairly stranded. Luckily a thoughtful friend had provided me with letters to the scattered residents along the road; and I proceeded with one to Mr. Perry, the assistant magistrate of the district,—a gentlemen well known for his urbanity and the many aids he affords to travellers on this neglected line of road. Owing to this being some festival or holiday, it was impossible to get Palkee-bearers: the natives were busy catching fish in all the muddy pools around. Some of Mr. Berry's own family also were proceeding to Darjeeling; so that I had only to take patience, and be thankful for having to exercise it in such pleasant quarters. The Mahanuddy, a small stream from the hills, cuts its way hard by this place, strewing the surrounding neighbourhood with sand: like most of the other streams, it frequently alters its course, causing endless disputes amongst the land-holders and farmers. Ortolans are amazingly abundant: the species is a little European wanderer; the flocks are large, and the birds so fat, that they make excellent table game here as at home. Now they are rapidly disappearing. They return from the north in September.

I had just got into bed at night, when the bearers arrived; so bidding a hurried adieu to my kind host, I proceeded onwards. The few novelties, to me, I found here are all small pasture-plants, especially lovers of damp ditch-banks, as *Hydrocotyle*, *Sphæranthus*, *Cotula*, and *Machlys*, a small *Hypericum*, *Gratiola*, some *Acanthaceæ* and *Scrophularineæ*, *Exacum*, *Oldenlandia*, *Polygona*, and *Oxalis*; *Clerodendron* is very common; the strict erect Bamboo is the almost only tree: there are no *Palms*, no *Bassia*, and but few *Fici*. Three more *Ferns* prove an increasing dampness on approaching the hills.

April 12th.—I awoke at 4 a.m., and found my Palkee on the ground

hard by a little village, and the bearers coolly smoking their hookahs under a tree (it was raining hard): they had carried me the length of their stage, twelve miles, and there were no others to take me on. I had paid £24 for my dawk, from Caragola to the hills, and had already bribed these men; so (very naturally I maintain) I lost all patience. After waiting and entreating several hours, I found the head-man of the village, and again bribed six out of the twelve bearers to carry the empty palkee, whilst I should walk to the next stage; or till we should meet some others. They agreed, and cutting the thick and spongy sheaths of the Banana, used them for shoulder-pads. They also wrapped them round the palkee-poles, to ease their aching clavicles. Walking along, I picked up a few more small plants, and at fourteen miles came to another village, Kallyagunje, on the banks of the Mahanuddy, which is here a middling-sized stream, with pebbles and small boulders of some pounds weight in its bed, brought so far from the hills (about thirty miles distant). Several bushes, new to me, grew on its banks; but the luggage-bearers were astern, and I could only take the smallest bits. Here, again, I had to apply to the head-man of the village, and bribe bearers to take me to Titalya, the next stage (fourteen miles). Some curious long low sheds at Kallyagunje puzzled me very much, and on examining them they proved to be for the growth of Paun, or Betel-pepper, which I here for the first time saw cultivated,—another indication of the moisture of the climate. These sheds are twenty to fifty yards long, eight or twelve or so broad, and scarcely five high; they are made of Bamboo, wattled all round and over the top. Slender rods are placed a few feet apart, inside, up which the Betel Vine, alias Pepper, climbs, and quickly fills the place with its deep green glossy foliage. The native enters every morning by a little door, and carefully cleans the plants. Constant heat, damp, and moisture, shelter from solar beams, scorching heat, and nocturnal radiation, are thus all procured for the creeper, which would certainly not live twenty-four hours, if exposed to the climate of this treeless district. Great attention is paid to the cultivation, which is very profitable. Snakes frequently take up their quarters in these hot-houses, and cause fatal accidents.

Titalya is a place of some importance: it was once a military station, and from its proximity to the hills has been selected by Dr. Campbell (the Superintendent of Darjeeling) as the site for an annual fair,

to which the mountain-tribes resort, as well as the people of the plains. The Calcutta road to Darjeeling by Dinagepore meets, near here, that by which I had come; and there is a Dawk, Bungalow, and Post; so that I found no difficulty in procuring bearers to proceed to Silligoree, where I arrived at 6 a. m., on the 13th.

Hitherto I had not seen the mountains, so uniformly were they shrouded by dense wreaths of vapor. This morning, when within eight miles of their base, I caught a glimpse of the outer range—sombre masses of far from picturesque outline, clothed everywhere with a dusky forest. They promise to be rich in plants.

Silligoree stands on the verge of the Terai, or that low swampy malarious belt which skirts the base of the sub-Himalaya, from the Sutledge to Brahma-kund in Upper Assam. Every feature, botanical, geological, and zoological, is at once new on entering this district, and foreign to the plains of India. The change is sudden and immediate; sea and shore are hardly more conspicuously different; nor, from the edge of the Terai, to the limit of perpetual snow, is any botanical region more strictly defined and clearly marked than this. The Himalayan vegetation commences here; properly to examine which (the object of my long-cherished desire) I must begin now, and follow Flora as high as she ascends, in my endeavour to connect the various vegetations, that will successively present themselves, with those physical characters of soil, aspect, elevation, and climate, to which they are attributable.

Since arriving at Darjeeling, I have been able to acquire a much better knowledge of the Terai district than many years of personal observation could have supplied, though my friend Mr. Hodgson, whose intimate acquaintance with its every feature, both here and in Nepal, where the malarious belt is much broader, has enabled him to define three zoological provinces due to geological formation and the nature of the soil; and which are accompanied by characteristic features in the vegetation.*

* I must, however, caution you that a description of the Terai district of Sikkim gives a very inadequate conception of this great feature of Indian geography and botany, and that this is not the only peculiarity of the Sikkim-Himalaya. In the first place the whole Himalaya range (though its snows reach a higher elevation than any other measured mountain is known to attain) forms a narrower belt here than either E. or W. The Terai is narrower, eight or ten miles in breadth instead of thirty, which is a most advantageous circumstance, and the outer hills, too, are nearer the snowy ridge, their united breadth being about sixty miles, whereas ninety is the usual average. The great Sal forest, which invariably occupies the outer belt, is

At present I confine myself to a description of the features I observed; and at a future time will give you a more detailed account of the Terai Flora as distinguished from that of the plains or mountains above.

(To be continued.)

Descriptions of some new Genera and Species of Plants, collected in the Island of Hong-Kong by Capt. J. G. Champion, 95th Regt., *by the late* GEORGE GARDNER, Esq., F.L.S., Superintendent of the Royal Botanic Gardens, Ceylon.

(continued from p. 246.)

OLACACEÆ.

Schœpfia *Chinensis*, Gardn. et Champ.; foliis ovato-oblongis vel oblongo-lanceolatis acuminatis basi acutis, racemis axillaribus solitariis, 2-4-floris, floribus sessilibus, corollæ tubo tereti, lobis acutiusculis.

HAB. Hong-Kong. Rare.

here cut down and replaced by the less gigantic vegetation I describe; and there are none of the sandstone hills which intervene between the plains of India and the slates, mica, schists, or gneiss of the true mountain range.

All along the S. frontier of Nepal the Terai is developed on the grandest scale and most typical form. Approaching from the plains, Hodgson tells me the prominent features are:—1st, a marshy belt, which is the Terai proper, found on the alluvium of the plains, at the exit by percolation of the numerous hill-streams; it is grassy and sedgy, not bushy or jungly. 2nd. Crossing this, the gravel-bed, formed of the detritus of the mountains, is reached: this is the same formation as I stepped on after crossing the Mahanuddy at Silligoree; but in Nepaul it supports a stupendous forest of Sal (*Shorea robusta*) and rank under-growth besides. The edges of the forest are so defined as to be seen from afar as a long black horizon line, and this is called the *Forest Region* by Hodgson. 3rd. A region of low hills and Dhoons (or Dunes). Within the gravel-bed and in the forest rise the sandstone hills: these I did not, as I said before, recognize, during my hurried walk across the Sikkim Terai; but they may form the nucleus of the flat-tipped spur I there ascended. In the Nepal Terai these sandstone hills undulate or rise in sharper ridges, are naked-topped, or covered with the gravel or *Sal forest*. *Pinus longifolia* sometimes grows on the drier heights, a tree whose mean elevation is 2000 feet. In some cases these hills form low ranges parallel to the great mountain-chain, and enclose transverse valleys (running E. and W.) which are very rare features in the Himalaya; these are called Dhoons (Dheyra Dhoon, &c.) Such valleys are floored with gravel, similar to that of the Terai: they may intervene between two separate parallel ridges of the sandstone, or have this rock for their southern boundary, and the true mica schist, gneiss, or slates of the sub-Himalaya, for their northern. The latter rocks compose the hills which rise uniformly here to heights of 8, 10, and 12000 feet, rarely more or less, and which flank the whole snowy range. The Terai vegetation, or hot low tropical vegetation, accompanied with malaria, then commencing from the marsh on the plains, (or the Mahanuddy in Sikkim) occupies all the gravel; whether that be on a flat surface, or resting on the sandstone hills, or flooring the Dhoons. It also stretches a little way at the foot of the mica schists, gneiss, and slate hills, where it is succeeded by the Oaks of the central temperate Himalayan region, which when he reaches, the traveller may account himself safe, and above the pestilential district.

Arbuscula ramosa, glaberrima. *Rami* subflexuosi, teretes, striati, albidi. *Folia* alterna, petiolata, pennivenia, 2½–3-poll. longa, 10–15 lin. lata: *petiolus* marginatus, 2–3 lin. longus. *Racemi* 6–9 lin. longi. *Corolla* lutea, 5 lin. longa. *Drupa* oblonga, utrinque obtusissima, 5–7 lin. longa.

This species agrees in many respects with Wallich's *S. fragrans;* but on comparing it with his detailed description in his edition of Roxburgh's "Flora Indica," I find it to differ in having few, not many, flowered racemes, and sessile, not pedicellate, flowers. The pedicels in his plant are described as being six lines long.

CLUSIACEÆ.

Calophyllum *membranaceum*, Gardn. et Champ.; ramulis junioribus 4-angularibus glabris, foliis oblongo-lanceolatis obtusis vel obtuse acuminatis basi acutis membranaceis, racemis axillaribus paucifloris petiolo paulo longioribus, pedicellis pedunculo plerumque longioribus puberulis basi bracteatis, bracteis linearibus membranaceis pedicello æquantibus, sepalis 4, petalis 8, drupa ovoidea.

HAB. Mount Victoria, Hong-Kong.

Arbuscula ramosa. *Folia* 3–3½ poll. longa, 10–14 lin. lata: *petiolus* subtus convexus, supra canaliculatus, 3–4 lin. longus. *Pedunculi* 1–3-flori. *Sepala* et *petala* obtusa, 3 lin. circiter longa. *Drupa* 8 lin. longa.

The four sepals and eight petals refer this species to Wight's first section of the genus; but it is very distinct from the only two species which it contains. Possibly it may prove either *C.? lanceolarum* of Roxburgh, or the *C. lanceolatum* of Blume, which he considers to be the same as Roxburgh's plant, but, like Roxburgh, had only met with it in a flowerless state. Till something more is known of them I prefer considering this a distinct species.

STAPHYLEACEÆ.

Staphylea *simplicifolia*, Gardn. et Champ.; foliis oppositis petiolatis simplicibus lanceolatis vel obovato-oblongis acuminatis basi cuneatis creberrimè calloso-serratis, paniculis terminalibus trichotomo-corymbosis, stylis coalitis pilosis.

HAB. Hong-kong. Flowers during spring.

Frutex ramosus, glaberrimus. *Rami* teretes. *Folia* opposita, simplicia, petiolata, lanceolata, vel obovato-oblonga, acuminata, basi cuneata, margine subrevoluta, creberrimè calloso-serrata, pennivenia, subtus

pallida, reticulata, supra viridia, $4\frac{1}{2}$–5 poll. longa, 15–22 lin. lata: *petiolus* subtus connexus, supra canaliculatus, 4 lin. longus. *Stipulæ* ad basim petiolorum 2, ovatæ, acutæ, margine scariosæ, ciliolatæ, 2 lin. longæ, deciduæ. *Paniculi* terminales, trichotomi-corymbosi, folio breviores. *Flores* pedicellati, pedicellis teretibus, apice incrassatis, 2 lin. fere longis, basi bracteolatis, bracteolis parvis, ovatis, acutis, ciliolatis, deciduis. *Calyx* coloratus, profunde 5-partitus, laciniis valde inæqualibus, 2 exter. minoribus, oblongis, obtusis, æstivatione imbricatis. *Corollæ petala* 5, sub disco hypogyno annulari 10-crenato inserta, oblonga, calycis laciniis alterna et subæquilonga, æstivatione imbricata, sub anthesin erecta. *Stamina* 5, cum petalis inserta, iisdem alterna: *filamenta* complanata, puberula; *antheræ* introrsæ, ovato-oblongæ, basi cordatæ, dorso adfixæ, longitudinaliter dehiscentes. *Ovaria* 3, sessilia, fere totam longitudinem coalita. *Ovula* juxta suturam ventralem 8, biseriata, horizontalia. *Styli* 3, filiformes, coaliti, pilosiusculi. *Stigmata* subcapitata.

The simple leaves well distinguish this very interesting species from all hitherto described ones.

CELASTRACEÆ.

Catha *Benthamii*, Gardn. et Champ.; inermis, ramis minute verrucosis, ramulis subflexuosis foliosis, foliis alternis oblongis vel obovato-ellipticis acuminatis basi acutis calloso-serratis supra nitidis, pedunculis axillaribus folio triplo brevioribus compressis striatis apice sub-7-floris, floribus subcorymbosis breviter pedicellatis, capsulâ obovatâ subtrigonâ.

Catha *monosperma*, *Benth. in Hook. Lond. Journ. Bot.* 1. *p*. 483.

HAB. Hong-Kong.

Frutex scandens? *Folia* pennivenia, supra viridia, subtus pallida et grosse reticulata, 3–$3\frac{1}{2}$ poll. longa, 15–20 lin. lata: *petiolus* subtus convexus, supra canaliculatus. *Calyx* 5-partitus, laciniis latè ovatis, obtusis. *Petala* ovato-oblonga, obtusa. *Antheræ* ovatæ, minutè purpureo-punctatæ, biloculares, loculis basi sejunctis, longitudinaliter dehiscentibus. *Capsula* coriacea, subtrigona, 9 lin. longa, loculicide trivalvis, valvis demum reflexis, abortu monosperma.

Bentham, in his enumeration of the plants collected by Mr. Hinds in Hong-Kong, in Hooker's "London Journal of Botany," i., p. 483, refers this plant to the *Celastrus monospermus* of Roxburgh; but on

comparing my specimens with Roxburgh's detailed description of the plant, I find that it differs in several points, besides the nature of the inflorescence, which, however, goes for nothing, since the panicles of Roxburgh are no doubt the young shoots from which the leaves had fallen, as already remarked by Mr. Bentham. More important distinctions exist in the leaves and the fruit; the former in Roxburgh's plant being glossy on both sides, while in this they are only so on the under; and while the fruit in the former is said to be nearly of the size of a field-bean, it is here as large as an ordinary cherry.

Hydrangeaceæ.

Adamia *Chinensis*, Gardn. et Champ.; foliis oblongis vel ovato-oblongis utrinque acuminatis mucronato-dentatis, cymis depressis compactis.

Hab. Rare in ravines on Mount Victoria, Hong-Kong.

Frutex ramosus. *Rami* obscure tetragoni, glabri, ramulis puberulis. *Folia* opposita, petiolata, oblonga, vel ovato-oblonga, utrinque acuminata, mucronata, serrato-dentata, pennivenia, subtus pallida et grossè reticulata, utrinque puberula, 5–7½ poll. longa, 1½–2½ poll. lata: *petiolus* pilosiusculus, 9–12 lin. longus. *Cymæ* paniculatæ, terminales, multifloræ, pubescenti-pilosæ. *Flores* pedicellati, pedicellis 4–6 lin. longis. *Calycis tubus* ovario adnatus, pilosus, 2 lin. longus, *limbus* 5-dentatus, dentibus latis, acutis. *Petala* 5, subcarnosa, oblongo-ovata, acuta, dentibus calycis alterna, disco epigyno inserta. *Stamina* 10, cum petalis inserta: *filamenta* complanata, maculata. *Antheræ* oblongæ, introrsæ, basifixæ, biloculares, loculis longitudinaliter dehiscentibus. *Ovarium* inferum, incompleto 5-loculare, placentis semiseptorum marginibus adnatis, multiovulatis. *Styli* 5, patentes: *Stigmata* clavata, compressa, integra, margine stigmatosa.

Judging from the figure in the Pl. As. Rar., this plant differs from Wallich's *A. cyanea*, in having the leaves much broader in proportion to their length, very much attenuated towards the base, and finely dentate, not coarsely serrated. The cyme is also shorter, flatter, and more compact. Decandolle describes the stigmas in Wallich's plant as 2-lobed, while in the figure, as in this plant, they are entire. *Cyanitis* of Rheinwardt differs in no way from *Adamia;* and it is very possible that the Nepaul, the Chinese, and the Java plants are only varieties of each other. This, however, can only be determined by a comparison of specimens.

HAMAMELIDACEÆ.

Eustigmá, *Gardn. et Champ.*

Char. Gen. *Calycis tubus* cum ovario connatus, limbo semisupero, 5-partito, laciniis æstivatione imbricatis. *Corolla* nulla. *Stamina* 5, cum petalis inserta, iisdem alterna; *filamenta* lata, brevissima; *antheræ* extrorsæ basifixæ, subtetragonæ, mucronatæ, biloculares, loculis valvula verticali persistente apertis. *Squamulæ* 5, cuneatæ, bilobæ, staminibus alternæ. *Ovarium* seminiferum, biloculare. *Ovula* in loculis solitaria, pendula, anatropa. *Styli* 2, distincti, longe exserti, facie interna stigmatosi; *Stigmata* magna, complanata, inæqualiter lobata, carunculoso-stigmatosa. *Capsula* seminifera, lignoso-coriacea, bilocularis, apice bivalvis, valvis dorso tandem fissis, endocarpio corneo, in coccos duos bivalves soluto. *Semina* in loculis solitaria, pendula. *Embryo* ignotus.—Arbuscula *Chinensis;* foliis *alternis, petiolatis, coriaceis, oblongis, acuminatis, versus apicem grossè dentatis, penniveniis, glabris,* stipulis *parvis subulatis, deciduis,* pedunculis *terminalibus, stellato-tomentosis,* floribus *laxè capitatis, pedicellatis* pedicellis *tribracteolatis.*

1. Eustigma *oblongifolium*, *Gardn. et Champ.*

Hab. Rare in ravines on Mount Victoria, Hong-Kong. Flowers in February.

Desc. *Arbuscula* ramosa, glabra, ramulis teretibus, minutè verrucosis. *Folia* alterna, petiolata, coriacea, oblonga, acuminata, basi acuta, versus apicem grossè dentata, dentibus mucronatis, pennivenia, supra viridia, subtus pallida et reticulata, 4–4½ poll. longa, 18–21 lin. lata: *petiolus* subtus convexus, supra canaliculatus, 4–5 lin. longus. *Stipulæ* parvæ, subulatæ, deciduæ. *Pedunculi* terminales, teretes, stellato-tomentosi. *Flores* laxè capitati, pedicellati, pedicellis stellato-tomentosis, 2 lin. longis, basi 3-bracteolatis, bracteolis latis, concavis, obtusissimis, extus stellato-tomentosis, pedicello subæquantibus. *Calyx tubo* obconico, cum ovario connato, stellato-tomentoso, lineam longo, *limbo* semisupero, 5-partito, laciniis rotundatis, apice eroso-dentatis, dentibus apice pilosiusculis 5-nerviis, ovario æquilongis, deciduis, æstivatione valvatis. *Corolla* nulla. *Stamina* 5, perigyna, calycis lobis opposita et breviora: *filamenta* lata, brevissima; *antheræ* extrorsæ, basifixæ, oblongo-tetragonæ, apice mucronatæ, biloculares, loculis valvula verticali persistente apertis. *Squamulæ* cuneatæ, emarginatæ, basi extus appendice incras-

sata sub-biloba instructæ, staminibus alternæ, iisdem duplo fere longiores. *Ovarium* vertice breviter exserto inferum, biloculare. *Ovula* in loculis solitaria, pendula, anatropa. *Styli* 2, distincti, longissime exserti, divaricati, clavati, facie externa striati, interna stigmatosi, $3\frac{1}{2}$-lin. longi. *Stigmata* valdè incrassata, complanata, irregulariter lobata, carunculoso-stigmatosa, violacea. *Capsula* seminifera, obovata, lignoso-coriacea, 6 lin. longa, bilocularis, apice bivalvis, valvis dorso tandem fissis, endocarpio corneo, in coccos duos bivalves soluto. *Semina* in loculis solitaria, pendula.

This plant was sent to me by Capt. Champion as a new species of *Hamamelis ;* but an examination of its characters soon led to the conclusion that, though more nearly related to that genus than any other belonging to the tribe, it has sufficient peculiarities to distinguish it as the type of a new one. These may be briefly stated as follows :—Pentamerous flowers, no corolla, extrorse anthers, and that excessive development of the styles and stigmas which has given origin to the name I have bestowed on it. The extrorse anthers are a remarkable peculiarity, this being the only individual belonging to the Order in which it exists.

Having, in the course of my examination of this genus, been led to make some investigations into the structure of the genera which at present compose the natural Order *Hamamelidaceæ*, and the affinities which they bear to other Orders, I shall in this place offer the result of these inquiries ; the more particularly as I have to propose the union of *Hamamelidaceæ*, *Altingiaceæ*, *Helwingiaceæ*, and *Bruniaceæ* into one group.

Until the year 1818, when Robert Brown established the Order *Hamamelidaceæ*, the genus *Hamamelis* stood among the genera related to *Berberideæ*, where it had been placed by Jussieu. At the same time Brown pointed out the affinity which exists between *Hamamelis* and the Cape genera *Brunia*, *Stavia*, &c., and suggested that they should form a distinct but nearly allied Order. At that period the characters which distinguish these two groups were more salient than they are at present ; the discovery of new genera in this, as in many other instances in the system, having so reduced them, that habit alone remains as a mark whereby to distinguish them. This must not, however, be taken into our calculations unless supported by more solid characters ; else the tiny heaths of Europe would not stand side by side with the lofty

Rhododendrons of India and Ceylon, or the humble herbaceous grasses of high latitudes with the Bamboos of the tropics.

The latest systematic work in which these two Orders are treated is Lindley's "Vegetable Kingdom;" and there the essential marks by which they are said to be distinguished from each other are the presence of stipules and anthers with deciduous valves in *Hamamelidaceæ;* and the want of the former, and extrorse anthers opening lengthwise, in *Bruniaceæ*. But let us examine how far these characteristic points are found to be general. With regard to stipules, which in a few Orders are of great value as accessory characters, they are distinctly stated not to exist in *Bucklandia;* nor are any to be found in *Tetracrypta*, a new genus belonging to the Ceylon Flora, which, in several points of structure, forms a transition from the one Order to the other.* Then in *Bruniaceæ* the anthers are not turned outwards but inwards; and I find that those of *Tetracrypta* are identical with those of *Brunia* itself; that those of *Dicoryphe*, *Corylopsis*, *Parrotia*, *Fothergilla*; *Distylium*, and *Bucklandia*, open by longitudinal slits; and that while in the other genera of *Hamamelidaceæ* they do open by valves, it is only in that section of *Hamamelis* to which

* I here offer a description of this genus.

TETRACRYPTA, *Gardn. et Champ.*

CHAR. GEN. *Calyx* tubo cum ovario connato, 8-costato, limbo supero, 4-partito, laciniis æstivatione valvatis. *Corollæ* petala 4, epigyna, cuneata, profundè lacerato-fimbriata, laciniis filiformibus, æstivatione valvato-involuta. *Stamina* 8, cum petalis inserta, alterna iisdem opposita breviora: *filamenta* filiformia, basi subdilatata; *antheræ* dorso insertæ, introrsæ, ovatæ, mucronulatæ, biloculares, loculis longitudinaliter dehiscentibus. *Squamulæ* nullæ. *Ovarium* inferum, 4-loculare. *Ovula* in loculis solitaria, pendula, anatropa. *Styli* 4, distincti, subulati, glabri; *Stigmata* subcapitata. *Fructus* ignotus.—Arbuscula *Ceylanica, glabra, Cinnamomii facie*; foliis *alternis, exstipulatis, coriaceis, ovato-oblongis, acuminatis, integerrimis*, 5-*nerviis, racemis supra axillaribus*, 1–3, *in seriem verticalem dispositis, subsimplicibus*, 8–12-*floris*, floribus *parvis, subsessilibus, basi unibracteatis*.

1. Tetracrypta *cinnamomoides*, *Gardn. et Champ.*

HAB. Ceylon. Not uncommon in the low jungles of the western and southern provinces.

DESC. *Arbuscula* ramosa, glabra, ramis teretibus, erectis demum pendulis. *Folia* alterna, breve petiolata, coriacea, ovato-oblonga, attenuato-acuminata, basi obtusa integerrima, glabra, parallele 5-nervia, nervis subtus prominulis, supra pallidè viridia, nitida, subtus pallidiora, reticulata, 4–5-poll. longa, $1\frac{1}{2}$–$2\frac{1}{4}$-poll. lata: *petiolus* semiteres, 3 lin. longus. *Stipulæ* nullæ. *Racemi* supra axillares, 1–3, in seriem verticalem dispositi, simplices vel basi subcompositi, laxè 8–12-flori, striati, puberuli, folio multo breviores. *Flores* subsessiles, parvi, 3 lin. longi, basi unibracteati, bracteis linearibus acutis puberulis tubo calycem æquantibus. *Calyx* tubo ovato, cum ovario connato, 8-sulcato, puberulo, $1\frac{1}{2}$ lin. longo, *limbo* supero, 4-partito, laciniis ovatis acutis, extus puberulis, tubo æquilongis, æstivatione valvatis. *Corollæ* petala 4,

Brown has given the name of *Toropetalum*, that the valves are deciduous. In both tribes the tube of the calyx adheres to the ovary; but in each the amount of union is very variable; for while among the genera of *Hamamelidaceæ* it is complete in *Dicoryphe* and *Tetracrypta*, it only extends to about a half in *Hamamelis*, *Corylopsis*, and *Eustigma;* and in *Parrotia* and *Fothergilla* I find it does not extend to a fourth. In *Bruniaceæ* there is a singular variation in this respect; for while the adherence is perfect in *Tittmannia*, in most of the other genera which I have had an opportunity of examining, it is only more or less half, and in the curious genus *Raspailia* we see the strange anomaly of a perfectly free calyx with epigynous stamens. This, however, is satisfactorily explained by *Brongniart*, in his memoir on the tribe, on the ground of the well known law of structure, that however much the parts of the flower may be combined, they all take their origin from nearly the same point; and that while in this instance there is no union between the calyx and the ovary, such does exist between the latter organ and the stamens and petals. In *Bruniaceæ* the lobes of the calyx are imbricated in æstivation; while in *Hamamelidaceæ* they are either valvate or imbricated.

All the genera of *Bruniaceæ* are petalous, and the æstivation is said to be imbricated. This I find to be the case in all the species I have examined; but *Brongniart* represents the petals of *Linconia alopecuroidia* as being valvate-involute, or exactly as in *Hamamelis* itself. In *Hamamelidaceæ* there are six petalous and six apetalous genera, and the æstivation is either sub-imbricate or valvate-involute.

In *Bruniaceæ* the stamens are definite, never exceeding five, very rarely four, and the filaments are either filiform or subulate. In *Hamamelidaceæ* they are either definite or indefinite, the genera in which

epigyna, cuneata, profunde lacerato-fimbriata, laciniis 5 filiformibus, æstivatione valvato-involuta. *Stamina* 8, cum petalis inserta, alterna iisdem opposita breviora: *filamenta* filiformia, basi subdilatata; *antheræ* introrsæ, dorso insertæ, ovatæ, mucronulatæ, basi cordatæ, biloculares, loculis longitudinaliter dehiscentibus. *Squamulæ* nullæ. *Ovarium* inferum, 4-loculare. *Ovula* in loculis solitaria, pendula, anatropa. *Styli* 4, distincti, subulati, glabri; *stigmata* subcapitata. *Fructus* ignotus.

The remarkable and suggestive shrub on which this genus is established, was first brought to my notice by Capt. Champion, who met with it during his residence at Galle in Ceylon, where I have since found it myself, as well as elsewhere, though neither of us has been fortunate enough to obtain ripe fruit. From the entire structure of its flower I was at first inclined to refer it to *Bruniaceæ*, the nature of the anthers, and the plurilocular ovary, being the principal inducements. But as I now unite *Bruniaceæ* to *Hamamelidaceæ*, and as its habit is more that of the latter tribe, I believe that it ought to range along with *Dicoryphe* of Thouars, with which it agrees in having tetramerous flowers, subulate filaments, and an 8-ribbed ovary.

they are definite being those which are most nearly related to *Bruniaceæ*, such as *Tetracrypta* and *Trichocladus.* Indeed, judging from the character of it given by Harvey, for I have no specimen to examine, *Trichocladus* seems to exhibit more the habit of *Bruniaceæ* than *Hamamelidaceæ*, but it has the large embryo of the latter tribe.*

The anthers in *Bruniaceæ* are introrse, and the cells burst by longitudinal slits. They are either ovate, with the cells diverging at the base, and attached by their back to the filament, or oblong, and attached by the base. In the character of the Order given in Lindley's "Vegetable Kingdom," the anthers are distinctly stated to be turned outwards; but in five genera which I have been able to examine, they are all turned inwards; and such also are they represented in the whole of the genera figured by Brongniart in his memoir.† The filaments are either filiform, subulate, or nearly wanting.

As in all the other points of structure the anthers of *Hamamelidaceæ* are very variable. I have already stated that in the new genus *Tetracrypta* they are not to be distinguished from those of *Brunia.* In *Parrotia*, *Fothergilla*, *Bucklandia*, and *Sedgwickia*, they are much the same as those of *Ardouinia*, *Thamnia*, and *Tittmannia*, being oblong, fixed by the base, and having the cells opening by longitudinal slits. In most of the other genera they are fixed by the base, but open by vertical valves, which in one instance, the *Hamamelis Chinensis*, Br., are deciduous. In all the other genera except *Eustigma* they are introrse.

In connection with the stamens there is another point of resemblance between the two Orders, both having sterile stamens alternating with the fertile ones. In *Bruniaceæ*, however, they only occur in a single species of *Brunia*, *B. nodiflora;* while in *Hamamelidaceæ* they are to be found in several of the genera. The existence of sterile stamens has not hitherto been distinctly stated to exist in *Brunia,* the petals, to which they adhere, being merely said to be bicrested. That they are sterile stamens there can be no doubt, for an attached filament may be traced along the mesial line of the petal from the same point as that from which the fertile stamens take their origin, and are clearly seen to belong to the same series. The two crests which occupy the middle of the petal are abortive anthers. Thus there is a tendency in both tribes to produce as many stamens as there are sepals and petals.

* "The genera of South African Plants," p. 127. † Annal. des sc. Août, 1826.

In the economy of the ovary again the most striking similitude obtains between the two Orders. In both it adheres more or less to the inner wall of the calyx, and in both is usually, but not always, 2-celled. In *Bruniaceæ* the cells are either 1, 2, or 3 in number. The genera which have only one cell are *Berzelia* and *Thamnia*. In the former instance this is owing to the abortion of a carpel, and in the other to the suppression of the dissepiments of an ovary consisting of five carpels. In *Ardouinia* there are three cells, while all the other genera have two. Hitherto the *Hamamelidaceæ* have always been considered to be a strictly bilocular family, but the discovery of *Tetracrypta*, in which there are four cells, destroys this uniformity.

In both tribes the number of ovules in each cell is variable. In *Bruniaceæ* they are always pendulous, and either one or two in number, in the latter case being always collateral. In *Hamamelidaceæ* they are always solitary and pendulous in the normal genera; but in the aberrant ones they are numerous, and attached to placentæ which adhere to the dissepiment. In both tribes the styles are always equal in number to the carpels. In *Bruniaceæ* they are either distinct or more or less united, while in *Hamamelidaceæ* they are always distinct. The stigmas in *Bruniaceæ* are always small and papilliform, and such is also the case in several of the genera of the other Order; but in others, *Eustigma* for instance, they are much enlarged, and covered with carunculate papillæ, which often extend down the inner face of the styles, as in *Eustigma* and *Bucklandia*.

In neither of the tribes is there an uniform structure of fruit. In both it is more or less capsular, the capsule being of a more woody texture in *Hamamelidaceæ* than in *Bruniaceæ*. In both the seeds are pendulous, and furnished with an abundant fleshy albumen. In both the embryo is orthotropal, with the radicle pointing to the hilum; but while in *Bruniaceæ* the embryo is placed at the apex of the albumen next the hilum, and has a short conical radicle and small fleshy cotyledons, it occupies about the centre of the albumen in *Hamamelidaceæ*, has a cylindrical radicle, and the cotyledons are somewhat foliaceous.

Grubbia and *Ophiria*, two Cape genera, formerly referred to *Santalaceæ*, but now to *Bruniaceæ*, I have not seen. By Endlicher they are formed into a distinct tribe under the name of *Grubbiaceæ*, which in his "Enchiridion Botanicum" he places subordinate to *Bruniaceæ*. A careful examination of them by Arnott, leads him also to consider that

they ought to form a distinct Order (*Ophiriaceæ*), their structure being intermediate between that of *Hamamelidaceæ* and *Bruniaceæ*, the tendency being greatest towards the latter; * but if Harvey in his character of *Grubbia* is correct in stating that the anthers open by valves,† the affinity, I should think, is more with the former group; and when better known they will most probably be referred thither.

It is then from a consideration of all these circumstances that I feel myself justified in uniting the two tribes, there being in reality no single point of structure by which to distinguish them, except, indeed, the difference in size in the embryo, which in other cases is not considered of ordinal importance.

The genus *Helwingia*, which at present constitutes a distinct Order, placed by Endlicher in his "Genera Plantarum" at the end of *Santalaceæ*, but removed in his "Enchiridion Botanicum" to the end of *Bruniaceæ*, and by Lindley near to *Garryaceæ*, seems, notwithstanding its peculiar mode of inflorescence and unisexual flowers, to be very closely related to *Hamamelidaceæ* Besides the former peculiarity, which is of no ordinal importance, there is no other character by which to separate them; for we have among the *Hamamelidaceæ* a tendency towards unisexuality in *Bucklandia* and its allies, and one half of the genera, as we have seen, are apetalous. Then the stipules, the adherent ovary, the epigynous disk, the solitary pendulous anatropal ovules, the styles covered with verrucose papillæ on their inner face, the subcapsular fruit, consisting of three or four one-seeded cocci, the minute embryo at the apex of solid fleshy albumen, and the superior radicle, all indicate the natural tendency of *Helwingia* towards *Hamamelidaceæ*. Decaisne, to whom we are indebted for an excellent figure and description of the the plant,‡ did not overlook this affinity, but thought it sufficiently distinct to constitute a separate order.

Sedgwickia was established as a genus by Griffith in the 19th vol. of the "Asiatic Researches," and by him considered to be nearly allied to *Bucklandia* of Brown; but in a later paper in the same work,‖ it is stated by the author to be identical with *Altingia* of Noronha. Now *Altingia* is referred by Blume to *Liquidambar*, and therefore the three

* Hooker's Journ. Bot. 3, p. 625. † The Genera of South African Plants, p. 410.
‡ Nouv. Ann. des Sc. nat. 6, p. 68, t. 7.
‖ I cannot indicate in what vol.; as my copy of the Essay in which he makes the statement is a detached one. The paper is entitled "Some account of the Botanical Collection, brought from the eastward by Dr. Cantor. By W. Griffith, F.L.S."

genera would seem to be identical; but so far as my materials allow me to judge, I am inclined to think that *Sedgwickia* should be kept separate. How far the other two may be distinct I have not the means of determining; but that they should all range along with *Bucklandia* in *Hamamelidaceæ* I have no doubt. *Sedgwickia* is the only one of the three of which I possess specimens, and they are from Griffith himself. In these specimens the flowers are rather too mature to be examined with accuracy, but they seem to be hermaphrodite, as indicated by Griffith. The flowers form a dense globose head, and are all connate, that is, the calyces adhere to each other by their external walls, and by their inner to the ovary, to within a little of its apex. The limb is divided into about twelve short irregular, somewhat triangular, lobes, between which and the styles the stamens are inserted on an epigynous disk. The stamens are numerous, perhaps about twenty, but I have not been able to make out the exact number. The filaments are so very short that the anthers may be said to be almost sessile, and these latter are oblong, turned inwards, two-celled, with the cells opening by longitudinal slits. The ovary is more than half-inferior, and two-celled. The ovules are very numerous, roundish, flattened, and attached to placentæ which adhere to the dissepiment. The styles are subulate, revolute, and grooved, and stigmatose on their inner face.

What Griffith's reasons were for supposing that *Sedgwickia* was identical with *Altingia*, I have no means of ascertaining; but that such a conclusion was premature, is, I think, certain, if the characters of the one genus be compared with those of the other. It was, however, this assertion, together with some remarks on the relations of the present Order, that first called my attention to the affinity which exists between *Hamamelidaceæ* and *Liquidambar*. Griffith's words are—"The family *Balsamifluæ* appear to be generally allied to *Plataneæ*, *Salicineæ*, and some of their neighbours. And although the structure of *Bucklandia* was not detailed before 1836, it still appears to me odd that no indication of the similarity of *Liquidambar* with *Fothergilla* had been noticed."

Although *Liquidambar* is monœcious, that is not a sufficient reason for excluding it from *Hamamelidaceæ*, for *Bucklandia* is polygamous, and *Sedgwickia* may prove so likewise. *Liquidambar* has also the copious albumen of *Bucklandia*, which is wanting in those Orders with which Lindley has associated it in his "Vegetable Kingdom."

My remarks on the general affinity of the Order *Hamamelidaceæ*, as now constituted, will be few, these having already been pretty accurately determined. That its relations with other families should be numerous is indicated by the many modifications of structure which it contains within itself. Its position is evidently that which has been assigned to it by Decandolle, Brongniart, and Lindley, viz. in the vicinity of *Umbelliferæ*, *Araliaceæ*, and *Cornaceæ*; while it has affinities that point through the aberrant genera, such as *Bucklandia*, &c. to the amental and urtical tribes, through *Helwingia* to *Euphorbiaceæ*, through the true *Hamamelideæ* to *Combretaceæ* and *Alangiaceæ*; while through *Bruniaceæ*, as shown by Brongniart, it tends towards *Myrtaceæ* by its similarity to *Bæckia*.

(*To be continued.*)

BOTANICAL INFORMATION.

BOTANICAL SOCIETY OF LONDON.

Friday, 7th September, 1849.—John Reynolds Esq., Treasurer, in the Chair.

The following donations were announced.—British Plants from Dr. Mateer, Mr. John Tatham, Mr. Henry Fordham, Mr. J. B. French, Mr. Thomas Moore, Mr. Robert Withers, Miss A. M. Barnard, and Mr. T. C. Heysham.

Mr. C. C. Babington presented specimens of *Rubus pyramidalis* (Bab.) and *Rubus incurvatus* (Bab.) collected by him at Llanberis, North Wales, in September last. (These specimens were sent in April last, but had remained at the Linnæan Society in a parcel, addressed to a Fellow who did not happen to call there until some months afterwards.)

Specimens of *Odontites verna*, and *Odontites verna, var. elegans*, were exhibited from Mr. John Ball, in illustration of the plants described by him in the Botanical Gazette for September.

A paper was read from Mr. W. H. Coleman, "On the plants indigenous to the neighbourhood of Horsham, Sussex."

Descriptions of some new Genera and Species of Plants, collected in the Island of Hong-Kong by Capt. J. G. Champion, 95th Regt., *by the late* George Gardner, Esq., F.L.S., Superintendent of the Royal Botanic Gardens, Ceylon.

(*Continued from p.* 320.)

The following is the modification of the character of the Order which I propose, to which are added the tribes and sections into which the genera naturally resolve themselves. The genera of the tribe *Brunieæ* are not subdivided, my materials not being sufficient to enable me to do so.

Hamamelidaceæ.

Hamamelideæ, *R. Br. in Abel's Voy.*—Bruniaceæ, *R. Br. in eadem.* —Balsamifloræ, *Bl. in Flor. Javæ.*—Helwingiaceæ, *Decaisne in Nouv. Ann. des Sc. Nat.* vol. vi. p. 68.—Grubbiaceæ, *Endl. Enchirid.* p. 403.—Ophiriaceæ, *Arnott in Hook. Jour. Bot.* vol. iii. p. 266.

Frutices vel *arbusculæ*, rarius arbores vastæ, ramulis teretibus sæpe pube stellata conspersis. *Folia* alterna, petiolata, penninervia, integerrima vel sinuato-dentata, aut sæpe acerosa, sessilia et imbricata. *Stipulæ* aut nullæ, aut ad basin petiolorum geminæ, deciduæ, interdum inæquales. *Flores* hermaphroditi vel abortu diclines aut polygami, terminales vel axillares, subsessiles, fasciculati, capitati vel spicati, sæpius bracteati. *Calyx* tubo ovario plus minus adhærens, rarissime liber, limbo quadrifido vel quinquifido aut partito, persistente vel deciduo, lobis per æstivationem imbricatis, rarissime obsolete repando-dentato. *Torus* in laminam tenuem, tubum calycis cum ovario connectentem vel ovarium obducentem expansus, rarissime in discum epigynum effusus. *Corolla* nunc nulla, nunc petala calycis fauce inserta, ejusdem lobis alterna, nunc unguiculata, spathulata, nunc elongato-ligulæformia, libera vel rarissime mediantibus staminibus basi in tubum cohærentia, per æstivationem imbricata, decidua vel rarius marcescenti-persistentia. *Stamina* cum petalis inserta, nunc iisdem numero æqualia, nunc duplo, alterna petalis opposita semper sterilia, squamulæformia, nunc subindefinita. *Filamenta* nunc brevia, basi dilatata, nunc filiformia vel subulata, libera vel interdum petalorum unguibus basi adglutinata. *Antheræ* introrsæ, rarissime extrorsæ, biloculares, erectæ vel incumbentes, loculis oppositis, utrinque connectivo,

sæpius in acumen uncinatum producto adnatis, rima longitudinali dehiscentes, aut facie pariete demum tota, vel usque ad dissepimentum secundarium soluta et decidua, nunc antheræ hippocrepicæ, rima marginis semicirculari hiantes. *Ovarium* tubo calycino adnatum, semiinferum vel inferum, rarissime a calyce liberum, e carpidiis duobus, vel abortu unico, rarius tribus quatuor vel quinque, septis tunc evanidis constans, uni- bi- tri- vel quadriloculare. *Ovula* in loculis solitaria vel gemina collateralia, ex apice dissepimenti pendula, rarissime plurima e placenta apice dissepimenti inserta imbricatim pendula, in ovario alterius carpidii abortu uniloculari ex apice placentæ parietalis solitaria, in *Thamnea* e columnæ centralis vertice dilatato unica serie dena, pendula, anatropa vel semianatropa. *Styli* 2–3, rarissime 4, distincti vel basi aut juxta totam longitudinem connati. *Stigmata* simplicia aut subcapitata, interdum verrucoso-papillosa. *Fructus* semiinferus vel inferus aut rarissime liber, coriaceus vel sublignosus, 1–4-locularis, indehiscens, vel capsularis, sæpius di- tri- vel tetra-coccus, coccis demum secedentibus et interne longitudinaliter dehiscentibus. *Semina* pendula, in loculis solitaria, interdum gemina, rarius plura deformia, unicum inferum fertile ; *testa* crustacea, lævi vel reticulata, rarius in alam membranaceam expansa. *Albumen* copiosum, carnosum vel subcartilagineum, album. *Embryo* in axi vel apice albuminis orthotropus, ejusdem fere longitudine, vel minimus. *Cotyledones* foliaceæ vel crassæ. *Radicula* cylindrica vel conica, supera, in *Bruniaceis* umbilicum attingens.

TRIBUS I. ALTINGIEÆ.—*Arbores* vastæ. *Flores* dioici vel polygami, corollati vel apetali. *Ovarii* loculi pluriovulati.

1. Liquidambar, *Linn.*
2. Sedgwickia, *Griff.*
3. Bucklandia, R. Br.

TRIBUS II. HAMAMELEÆ.—*Arbusculæ. Flores* hermaphroditi, rarissime dioici, corollati vel apetali. *Stamina* 4–24, omnia fertilia, vel alterna petalis opposita semper sterilia, squamulæformia. *Antheræ* dehiscentiâ variæ. *Ovarii* loculi uniovulati.

SUBTRIBUS I. *Fothergilleæ.*—*Flores* hermaphroditi, apetali. *Stamina* 24, omnia fertilia. *Antheræ* hippocrepicæ, rima semicirculari dehiscentes.

4. Fothergilla, *Linn. fil.*

SUBTRIBUS II. HELWINGIEÆ.—*Flores* dioici, apetali. *Stamina* 3–4, omnia fertilia. *Antheræ* rima laterali dehiscentes.

5. Helwingia, *Willd.*

SUBTRIBUS III. EUHAMAMELEÆ.—*Flores* hermaphroditi, corollati vel apetali. *Stamina* 8–10, alterna fertilia, alterna sterilia. *Antheræ* valva verticali vel rima laterali dehiscentes.

SECTIO I.—*Antheræ valva verticali dehiscentes.*

6. Eustigma, *Gardn. et Champ.*
7. Hamamelis, *Linn.*
8. Loropetalum, *R. Br.*

SECTIO II.—*Antheræ rima laterali dehiscentes.*

9. Corylopsis, *Sieb. et Zucc.*
10. Dicorypha, *Thouars.*

SUBTRIBUS. IV. PARROTIEÆ.—*Flores* hermaphroditi, corollati vel apetali. *Stamina* 5–8, omnia fertilia. *Antheræ* rima laterali dehiscentes.

11. Tetracrypta, *Gardn. et Champ.*
12. Parrotia, *C. A. Meyer.*
13. Distylium, *Sieb. et Zucc.*
14. Trichocladus, *Pers.*

TRIBUS III. BRUNIACEÆ.—*Frutices* capenses, ericoidei. *Flores* hermaphroditi, semper corollati. *Stamina* corollæ laciniis numero æqualis, iisdem alterna, omnia fertilia. *Antheræ* introrsæ, rima longitudinali dehiscentes. *Ovula* solitaria vel gemina collateralia.

COMPOSITÆ.

Cirsium (*Onotrophe*) *Chinense*, Gardn. et Champ.; caule simplici 1-cephalo folioso angulato sublanuginoso, foliis sessilibus linearibus acuminatis cum mucrone rigidulis indivisis setoso-ciliatis utrinque glabris, capitulis bibracteatis, bracteis foliaceis capitulo brevioribus, involucri squamis adpressis lineari-lanceolatis acuminato-subspinosis versus apicem sublanuginoso-arachnoideis, intimis longioribus margine ciliolatis apice acuminatis scariosis reflexis.

HAB. Hong-Kong.

Herba 1½-pedalis. *Radix* et folia radicalia ignota. *Capitula* pollicaria. *Corollæ* purpureæ. *Filamenta* hispida. *Pappi* setæ inæquales, plures apice clavellulatæ.

Somewhat intermediate between *C. angustissimum* and *C. serratuloides*, the former an Indian, the latter a Siberian species.

Myrsiniaceæ.

Ardisia (*Euardisia*) *primulæfolia*, Gardn. et Champ.; undique ferrugineo-villosis villis articulatis, caule humili simplici, foliis apice caulis aggregatis breviter petiolatis oblongo-obovatis obtusissimis versus basin subcuneatis late et obtuse crenatis, pedunculis axillaribus folio brevioribus apice umbellatis, umbellis compositis, pedicellis flore duplo fere brevioribus, lobis calycinis lineari-oblongis acutiusculis drupa duplo brevioribus.

Hab. Rocky shady banks on Mount Victoria, Hong-Kong. Flowers in June, and ripens its fruit in December and January.

Planta suffruticosa humilis, habitu *Acrotremæ*. *Folia* subsessilia, membranacea, punctata, pennivenia, supra viridia, subtus pallida et grosse reticulata, 4–6 poll. longa, 1½–3 poll. lata. *Pedunculi* angulati, dense ferrugineo-villosi. *Umbellæ* 4–6-floræ. *Pedicelli* 4–6 lin. longi, basi bracteati, bracteis ovato-oblongis, obtusis 1½–2 lin. longis. *Calyx* 5-partitus, lobis erectis, æstivatione subvalvatis, non convolutis, extus pilosus, 1½ lin. longus. *Corolla* rosea, punctata, 5-partita, lobis ovato-oblongis, acutis, patentibus, 3 lin. longis, æstivatione sinistrorsum convoluta. *Stamina* 5, tubo corollæ inserta; *filamentis* brevissimis; *antheris* erectis, oblongis, acutis, basi emarginatis. *Stylus* filiformis, apice subulatus. *Drupa* globosa, glabra, coccinea, 4½ lin. longa.

A very remarkable dwarf species allied to *A. vestita*, Wall., from which it differs in its habit, broader obtuse leaves, leafless peduncles, and smooth fruit. The calycine segments are widely separated from each other by the rounded intervening sinuses, and, even in the youngest state in which I have been able to examine them, do not seem to overlap each other at the margins.

Loganiaceæ.

Medicia, *Gardn. et Champ.*

Char. Gen. *Calyx* tubo nullo 5-partitus, ad basin fructus persistens, lobis ovatis, imbricatis, æqualibus. *Corolla* infundibuli-campanulata: *tubo* dilatato intus glabro: *limbo* 5-partito, lobis oblongis acutis subæqualibus imbricatis. *Stamina* 5, medio tubi inserta, lobis corollæ alterna, inclusa: *filamenta* complanata: *antheræ* basi affixæ, ovato-oblongæ, basi cordatæ, biloculares, loculis lateraliter longitudinaliterque dehiscentibus. *Ovarium* liberum, oblongum, glabrum,

biloculare. *Ovula* in placentis carnosulis, dissepimento utrinque adnatis plurima, biserialia, amphitropa. *Stylus* filiformis, glaber: *stigma* bifidum, lobis oblongis bifidis. *Capsula* ovato-oblonga, inflata, membranacea, bilocularis, matura septicide ab apice ad basin dehiscens, valvis intus septo longitudinaliter fisso, ad apicem bifidis. *Placentæ* parvæ, lineares, valvularum margine adfixæ. *Semina* plurima, peltata, compressa, muricata, alâ membranaceâ inciso-dentatâ cincta. *Embryo* ignotus.——Frutex *Chinensis*, *glaber*, *volubilis*; foliis *oppositis*, *petiolatis*, *lanceolato-ovatis*, *acuminatis*, *glabris*, *integerrimis*, margine stipulari *inter petiolos subobsoleto*, floribus *terminalibus*, *trichotomo-corymbosis*.

1. Medicia *elegans*, Gardn. et Champ.

HAB. Hong-Kong.

Frutex glaber, volubilis. *Rami* teretes, cortice cinnamomeo vestiti. *Ramuli* oppositi, puberuli. *Folia* opposita, petiolata, lanceolato-ovata, longe acuminata, basi acuta, integerrima, glaberrima, pennivenia, supra viridia, subtus pallida et grosse reticulata, 3–4 poll. longa, 12–18 lin. lata: *petiolus* supra canaliculatus, 4½ lin. longus. *Stipulæ* intra-petiolares ad vittulæ transversales reductæ. *Corymbi* terminales; trichotomi, multiflori, puberuli: *pedicelli* in sicco angulati, 3 lin. longi, basi bracteati, bracteis lanceolatis acuminatis lineam longis. *Calyx* tubo nullo 5-partitus, liber, ad basin fructus persistens, lobis ovatis subacuminatis margine ciliatis imbricatis æqualibus 1½ lin. longis. *Corolla* hypogyna, infundibuli-campanulata, 7½ lin. longa, pallide lutea, intus sparse rubro-punctatæ (ex Champ.): *tubo* dilatato, intus glabro: *limbo* 5-partito, lobis oblongis acutis subæqualibus imbricatis. *Stamina* 5, medio tubi inserta, lobis corollæ alterna, inclusa: *filamenta* complanata: *antheræ* basi affixæ, ovato-oblongæ, basi cordatæ, biloculares, loculis lateraliter et longitudinaliter dehiscentibus. *Ovarium* liberum, oblongum, acutum, glabrum, biloculare. *Ovula* in placentis carnosulis, dissepimento utrinque adnatis, plurima, biserialia, amphitropa. *Stylus* filiformis, glaber: *stigma* bifidum, lobis oblongis bifidis. *Capsula* ovato-oblonga, inflata, membranacea, 7 lin. longa, bilocularis, matura septicide ab apice ad basin dehiscens, valvis intus septo longitudinaliter fisso, ad apicem bifidis. *Placentæ* parvæ, lineares, valvularum margini adfixæ. *Semina* plurima (in utroque loculo 15 circiter), peltata, compressa, minute muricata, alâ membranaceâ inciso-dentatâ late cincta, 2 lin. lata. *Embryo* ignotus.

This, as a genus, will range along with *Gelsemium* of Jussieu, a native of North America, from which it is principally distinguished by its imbricated, not quincuncial, æstivation of the corolla, inflated capsule, and numerous peltate, compressed seeds, surrounded on all sides by a broad inciso-dentate membranous wing. They have both somewhat the same habit, *Gelsemium* being said to be scandent, while the present plant is certainly a twiner. The leaves of the former are stated by Alphonse De Candolle to be "pellucido-punctata," which is not the case in *Medicia*. I regret that none of the seeds on my specimens are in a forward enough state to enable me to ascertain the nature of the embryo.

Until Alphonse De Candolle determined the proper position of *Gelsemium* in the system, it was considered at one time to belong to *Apocynaceæ*, and at another to *Bignoniaceæ*. From the latter it is separated by the presence of albumen, and from the former by the nature of the stigma. In the structure of the capsule, it as well as *Medicia* are intimately connected with *Usteria* and *Antonia*, the mode of dehiscence being exactly the same. They also agree in the position and structure of their seeds, but differ in the mode of placentation; *Antonia* and *Usteria* being possessed of thick fleshy placentæ, which ultimately separate from the dissepiment, while the seeds in *Gelsemium* and *Medicia* are attached in a double series to the middle of the dissepiment, which in both cases is formed by the inflexed margins of the carpels. At one time I was inclined to unite these four genera into a single tribe, characterized by the dehiscence of the capsule; but a more natural plan will be to allow *Gelsemieæ* to remain, being well distinguished by the imbricated æstivation of the corolla and marginal placentation; while *Usterieæ* and *Antonieæ* should be combined under the latter name, and the principal character taken from the valvate æstivation of the corolla and the fleshy detached placentæ.

Among a large collection of Malacca plants which I received from the late Mr. Griffith shortly before he died, I find a remarkable new genus very nearly related to *Antonia*, in which, though the fruit and seed are almost the same as in the latter genus, the radicle is superior, not inferior.*

* The following is a description of this genus :—

NORRISIA, *Gardn.*

CHAR. GEN. *Calyx* 5-partitus, basi bibracteatus, sepalis parvis ovatis obtusis imbricatis persistentibus. *Corolla* hypocrateriformis, fauce hirsutâ : *tubo* extus

The genus *Medicia* I have dedicated to the memory of Lorenzo de' Medici, who, at his villa at Careggi, near Florence, possessed, according to Roscoe, his elegant historian, one of the earliest collections of plants in Europe which deserves the name of a Botanical Garden.

tomentoso, basi subinflato; *limbo* 4-partito, lobis ovato-oblongis æqualibus tubo triplo brevioribus demum reflexis, æstivatione valvatâ. *Stamina* 5, lobis corollæ alterna, fauce inserta, exserta: *filamenta* filiformia, sub-puberula; *antheræ* dorso affixæ, subrotundæ, compressæ, biloculares, loculis curvato-sublunatis longitudinaliter dehiscentibus. *Ovarium* liberum, oblongum, biloculare. *Ovula* in placentis carnosis, dissepimento utrinque adnatis, plurima, amphitropa. *Stylus* filiformis, exsertus, glaber, deciduus; *stigma* subcapitatum. *Capsula* oblonga, tomentosa, bilocularis, matura septicide ab apice ad basin dehiscens, valvis intus septo longitudinaliter fisso. *Placentæ* carnosæ, lineari-oblongæ, septo adnatæ, demum liberæ. *Semina* plurima, peltata, compressa, linearia, nempe basi et apice in alam membranaceam acutam producta. *Embryo* intra albumen carnosum minutus, cylindricus, retusus, axilis; *radiculâ* crassiusculâ, obtusâ, superâ; *cotyledonibus* oblongis, obtusis.—Frutex *Malaccensis;* foliis *oppositis, petiolatis, ovato-ellipticis, obtusis, integerrimis, subtus puberulis,* petiolis *vittula transversali connexis,* corymbis *terminalibus, compactis,* ramis *ferrugineo-tomentosis.*

1. Norrisia *Malaccensis, Gardn.*

HAB. Peninsula of Malacca, *Griffith.*

Frutex ramosus. *Rami* teretes, junioribus puberulis. *Folia* opposita, petiolata, ovato-elliptica, obtusa, basi acutiuscula, integerrima, supra viridia, glabra, nitida, subtus pallida, puberula, reticulata, pennivenia, venis subtus prominulis, $2\frac{1}{2}$–3 poll. longa, 1–$1\frac{1}{2}$ poll. lata: *petiolus* semiteres, supra canaliculatus, puberulus, 3 lin. longus, nervo transverso loco stipulæ junctus. *Corymbi* terminales trichotomi, multiflori, compacti, ferrugineo-tomentosi; *pedicelli* brevissimi, basi unibracteati, bracteis ovatis acutis tomentosis. *Calyx* liber, parvus, 5-partitus, basi bibracteatus, sepalis ovatis obtusis imbricatis persistentibus extus tomentosis margine ciliatis semilineam longis. *Corolla* hypogyna, hypocrateriformis, alba (?), fauce hirsutâ: *tubo* extus tomentoso, 3 lin. longo, basi subinflato; *limbo* 4-partito, lobis ovato-oblongis, æqualibus, tubo triplo brevioribus, demum reflexis, æstivatione valvatâ. *Stamina* 5, lobis corollæ alterna, fauce inserta, exserta: *filamentis* filiformibus, subpuberulis, *antheris* dorso affixis, subrotundis, compressis, bilocularibus, loculis curvato-sublunatis, longitudinaliter dehiscentibus. *Ovarium* liberum, oblongum, biloculare. *Ovula* in placentis carnosis, dissepimento utrinque adnatis, plurima, amphitropa. *Stylus* filiformis, exsertus, glaber, deciduus; *stigma* subcapitatum, pilosiusculum. *Capsula* oblonga, $4\frac{1}{2}$ lin. longa, tomentosa, bilocularis, matura septicide ab apice ad basin dehiscens, valvis intus septo longitudinaliter fisso. *Placentæ* carnosæ, lineari-oblongæ, septo adnatæ, demum liberæ. *Semina* plurima, peltata, compressa, linearia, nempe basi et apice in alam membranaceam acutam producta. *Embryo* intra albumen carnosum minutus, cylindricus, rectus, axilis; *radiculâ* crassiusculâ, obtusâ, superâ; *cotyledonibus* oblongis, obtusis.

With *Antonia* of South America this plant entirely agrees in habit, and is only essentially distinguished from it by the calyx being bi- not multibracteate, the seeds being round and compressed, not linear, the seeds being numerous, not solitary in each cell, and the radicle superior, not inferior. The nature of the placenta is also somewhat different. In *Antonia* it is attached to the middle of the dissepiment, as is well represented in Hooker's figure (Ic. Plant. t. 64.), is flat, elliptical, and much shorter than the cell; while in *Norrisia* it is linear-oblong, attached to the bottom of the cell as well as to the dissepiment, and occupies nearly the whole length of the

GESNERACEÆ.

1. Æschynanthus *Chinensis*, Gardn. et Champ.; foliis lanceolatis vel lanceolato-oblongis utrinque acuminatis integerrimis glabris penniveniis, pedunculis axillaribus et terminalibus apice trifloris bibracteatis, bracteis subrotundis obtusis pedicello brevioribus, calycis subrotati 5-partiti glabri lobis oblongis obtusis demum reflexis, corollæ tubuloso-subcampanulatæ 5-fidæ subbilabiatæ glabræ lobis obtusissimis, staminibus exsertis, filamentis pilosis.

HAB. Hong-Kong.

Suffrutex scandens, glaberrimus. *Folia* $2\frac{1}{2}$–3 poll. longa, 6–11 lin. lata. *Pedunculi* teretes, 1–$1\frac{1}{2}$ poll. longi. *Bracteæ* 3–$4\frac{1}{2}$ lin. latæ, glabræ. *Pedicelli* $3\frac{1}{2}$ lin. longi. *Calyx* vix 2 lin. longus, glaber, valde reflexus. *Corolla* rubra (?), 9 lin. longa. *Stylus* filiformis, crassus; *stigma* integrum, depresso-concavum. *Capsula* 6 poll. longa.

Very distinct from any hitherto described species, but belonging to the same section of the genus as *Æ. volubilis* of Jack. It is well distinguished by its calyx, which is small, somewhat rotate, and ultimately so much reflexed that the segments press against the pedicel. The peduncles and pedicels, as well as the bracts, are very variable in size.

Kandy, Ceylon, February, 1849.

PUCHA-PAT, *or* PATCHOULI (POGOSTEMON PATCHOULI); *by Sir* WILLIAM JACKSON HOOKER, K.H., D.C.L., *Director of the Royal Botanic Gardens at Kew.*

(Tab. XI.)

The dried tops of this celebrated fragrant plant, as well as the essence, or alcoholic solution of the oil, are placed in the Museum of the Royal Gardens, presented by Mr. Ellis, drug-broker, and the living plant is seen in the stoves. Since the notices we gave of it at vol. vii. p. 385 of the London Journal of Botany, and at p. 23 of our present volume,

cell: it is therefore very similar to that of *Usteria*. I find that there are sometimes three carpels developed in *Antonia*; and Hooker is correct in representing the cells as many-ovuled.

I have named the genus in compliment to Sir William Norris, late Recorder at Penang, the friend and companion of Griffith in some of his excursions, and to whom I am indebted for a valuable collection of plants from Mount Ophir.

where it was stated that the flowers were unknown to us, our own plant, in the spring of the present year, 1849, has thrown up several flowering spikes, which have enabled us to give the accompanying figure and the following particulars :—

POGOSTEMON PATCHOULI ;

Pubescens, caule suffruticoso ramis vagis decumbenti-ascendentibus, foliis petiolatis rhombeo-ovatis obtusiusculis lobatis crenato-dentatis, spicis terminalibus axillaribusque densis pedunculatis basi interruptis, calycibus hirsutis bracteas ovatas duplo superantibus, dentibus lanceolatis, filamentis barbatis.

Pogostemon Patchouli, *Pellet. in Mém. de la Soc. Roy. des Sc. d'Orl. tom.* 5, *n.* 6 (1845), *cum. Ic. Benth. in De Cand. Prodr.* 12. *p.* 153.

Pogostemon intermedius, *Benth. in Wall. Cat., n.* 2327.

β ? spicis elongatis laxioribus subpaniculatis. P. Heyneanus. *Benth. in Wall. Pl. As. Rar.* 1. p. 31. *De Cand. Prodr.* 12. *p.* 153.

HAB. Silhet (Dr. Wallich) ; Penang and opposite shore of the Malay Peninsula (*Mr. G. Porter*). β. Ceylon, Java ; Bombay (*Mr. Law*).

Authentic specimens in our Herbarium of *P. intermedius*, Benth., from Dr. Wallich, prove that this plant is identical with the Patchouli ; but since by accident the species was omitted in the "Labiatæ" of De Candolle's 'Prodromus,' Mr. Bentham waives the right of priority, and desires the name of M. Lepelletier should be retained. He is, indeed, disposed to consider his *P. parviflorus* (Silhet, Assam, and Saharunpur) and even *P. Heyneanus* (Ceylon, Java, &c.) as not really specifically distinct ;—thus the species would have a wide range of native locality, unless, as is probable, the plant be only cultivated in these several places.

We think it unnecessary to give a full botanical description of this plant, which has been so well done by M. Lepelletier, in the memoir above quoted, and should rather devote our remaining space to some further notice of its properties and use. Dr. Pareira, in the Pharmaceutical Journal, for August, 1844, says :—

"Under the name of *Patchouli*, or *Pucha-pat*, are imported into this country" (only within these seven years, as Mr. Ellis informs us) "the dried foliaceous tops of a strongly odoriferous plant, called, in Bengalee as well as in Hindee, *Pucha-pat*. On the 27th of June, 1844, Mr. Ellis, drug-broker, of Fenchurch-street, put up for sale, at Garraway's Coffee-house, forty-six cases of this substance. Some of the packages

consisted of half-boxes, containing 50 lbs. each, others of whole boxes holding 110 lbs. each." (It was considered enough for ten years' consumption!) "The price asked was six shillings per pound, but there were no biddings. This lot came from New York, to which place it was said to have been carried from China. The dried tops imported into England are a foot or more in length. The odour is strong and peculiar; I cannot call it agreeable, though some others do, while many persons regard it as disagreeable. It is somewhat analogous to that of *Chenopodium anthelminticum.* The taste of the dried plant is very slight. By distillation it yields a *volatile oil*, on which the odour and remarkable properties depend. In Europe it is principally used for perfumery purposes. *Sachets de Patchouli* are sold in the shops. They consist of a few grains of the coarsely-powdered herb, mixed with cotton-wool, and folded in paper. Placed in drawers, chests, &c., they are said to drive away insects from linen, shawls, &c. An *Essence de Patchouli* is used by perfumers, principally for mixing with other scents in the preparation of compounded perfumes: for this purpose it is considered very useful. In India it is used as an ingredient in tobacco and for scenting the hair of women."

An ingenious writer, in the Gardener's Chronicle (1849, p. 645), on the odours of plants, remarks—"It has been said, by an eminent French perfumer, that the odour of *Patchouli* was a 'disgrace to the art'; such, however, is the result of fashion, that a year or two ago no lady of *ton* was perfect unless she was enveloped, as it were, in the fragrance of this plant, the odour of which is very peculiar—a sort of dry, mouldy, or earthy smell—not very enticing, certainly, by description, and much less so in reality. The characteristic smell of Chinese or Indian Ink is owing to an admixture of this plant in its manufacture. In the vegetable world it is the most permanent of odours. The origin of its use is this. A few years ago, real Indian shawls bore an extravagant price, and purchasers could always distinguish them by their odour; in fact, they were perfumed with *Patchouli.* The French manufacturers at length discovered this secret, and used to import this plant to perfume articles of their make, and thus palm off home-spun shawls for real India!"

References to the Plate.—Tab. XI. Flowering branch, *nat. size.* Fig. 1, flowers, buds, and bracteas; fig. 2, portion of a hair from the stamens: fig. 3, pistil; fig. 4, anther and part of a filament with hair: all more or less *magnified.*

Extracts from the private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

(*Continued from p.* 308.)

Calcutta to Darjeeling in Sikkim-Himalaya.

From Silligoree a sudden descent leads to the Mahanuddy river, here flowing S.W., in a shallow valley, over a gravelly bottom of small schist and slate pebbles. It is a bustling river, even at this season; its banks fringed with bushes, and as clear and sparkling as a trouting stream in Scotland. Beyond it, the Terai commences at once; the road ascends a little, winding through a thick brush-wood, choked with long grasses (*Sacchara*, &c.) and *Cyperaceæ*, and but few trees, chiefly of *Dalbergia Sissoo*, and a scarlet-fruited *Sterculia*. The soil is a red, friable clay and gravel, very ochreous; the gravel is all of quartz or mica and felspar pebbles, with scattered flakes of mica and occasionally grains of hornblende and perhaps felspar, the decomposition of which produces the clayey matrix. Covering this deposit is a layer of black unctuous vegetable mould, to appearance extraordinarily rich in humus, and probably in carbonaceous matter also, for the stubble of burnt grass was everywhere peeping through the green living herbage. At this season, only a few spring plants are in flower, amongst which a very sweet-scented *Crinum*, *Asphodel*, and especially a beautiful small *Curcuma*, were in the greatest profusion. Leaves of terrestrial *Orchideæ*, too, appeared, with Ferns (chiefly *Lomariæ*), *Triumfetta*, some *Sidæ*, and similar weeds of hot damp regions. After leaving the little valley of the Mahanuddy, this bed of gravel seems gradually to descend, with a very gentle slope, towards the foot of the hills. The beds, some dry, of many small streams, are crossed, all very tortuous, and invariably flowing in an easterly and westerly direction, instead of following a straight course from the mountains. Their banks are richly clothed with brush-wood and climbers of many Orders, such as *Convolvuli*, *Hiraea*, *Leea*, *Vitis*, *Menispermum*, *Cucurbitaceæ*, and *Bignoniaceæ*. The transverse course of these streams seems to indicate a slope *towards* the hills. Their pent-up waters, percolating the gravelly clay bed, and partly carried off by evaporation through the stratum of ever-increasing vegetable mould, must be one main agent in the production of the malarious vapours of this pestilential region. Add to this, the deten-

tion of the same amongst the jungly herbage; the amount of vapour in the humid atmosphere above, checking the upward passage of that from the soil; the sheltered nature of the locality at the immediate base of a lofty range; and probably the reverberation of heat from the mountains rising immediately above them. There appears to me to be here all necessary elements which, combined, will produce a maximum of stagnation and deterioration in the atmosphere loaded with vapour.

Fatal as this district is, and especially to the Europeans, a race inhabit it with impunity, and which, if not numerous, do not owe their paucity to any climatic causes. These are the Mechis,* often described as a squalid, sickly people, typical of the region they frequent; but who are, in reality, more robust than the Europeans in India, and whose disagreeably sallow complexion is deceptive as indicating a sickly constitution. They are described to me as a mild, inoffensive people, moral, and industrious for Orientals; they live by annually burning the Terai jungle and cultivating the cleared spots; and though so sequestered and isolated, unlike the Rajmahal and Behar Dangas, they rather court than avoid intercourse with those whites whom they know to be kindly disposed.

After proceeding some six miles in the gradually descending path, I came to a considerable stream, cutting its way through the gravel, with cliffs on each side of fifteen to twenty feet, here and there covered with a *Pteris* and other *Ferns*, the little *Oxalis sensitiva*, weedy *Acanthaceæ*, and other herbs. The road here suddenly ascends a steep gravelly hill, and opens out on a short flat, or spur, from which the Sub-Himalaya mountains abruptly rise, clothed with forest to the base; the little Bungalow of Punkabarrie, my immediate destination, nestled in the woods, crowned a lateral knoll, above which, to E. and W., as far as the eye could reach, were range after range of wooded mountain.

The character and vegetation of this flat is identical with that of the lower level from which I had ascended; the same gravelly subsoil, stratum of vegetable mould, the same grasses, herbs, and trees. *Curcuma* still continued the prevalent and typical plant; others are *Terminalia* and *Conocarpus*; *Ficus elastica*, here at its western limit, scarce and small. I observed no Palms, but this, and the absence of much more arboreous vegetation, is no doubt due to artificial causes, as clearing and burning. The flat, however, presents no water-courses, and ap-

* N.B. No relation to the Magic Strop.

pears to slope upwards to the foot of the true mountains. It has all the appearance of an enormous bed of gravel deposited on the plains of India, and resting against the base of the hills; and the same may be said of the whole gravel deposits intervening between this and Silligoree. The uniform level of the upper steppe is curious: does it indicate an ancient water-level? Abutting so abruptly upon the bases of very steep gneiss mountains, and descending at its outer edge so rapidly to the lower Terai level, it presents a curious contrast to both. This is a point to be attended to when I again, and at a better season, botanize the Sikkim-Terai. At this time it rains too hard to allow of my observing properly.

From this steppe, the ascent to Punkabarrie is sudden and steep, and accompanied with a total change in soil and vegetation. The mica slate and gneiss protrude everywhere, and the latter is as full of garnets as are our old friends the Perthshire Braedalbanes, whereon you first taught me to explore (how keenly I now appreciate these associations!) A giant forest now replaces the stunted and bushy timber of the Terai Proper. The *Careya* and *Shorea* form the prevailing trees, with *Cedrela* and the superb *Gordonia Wallichii.* Smaller timber and shrubs are innumerable; a succulent character pervades the bushes and herbs, occasioned by the prevalence of *Urticeæ.* Large Bamboos rather crest the hills than court the deeper shade; and of the latter there is abundance, for the torrents cut a straight, deep, and steep course down the hill flanks. The gullies they traverse are choked with vegetation and bridged by fallen trees, whose trunks are richly clothed with *Dendrobium Pierardi* and other epiphytical *Orchideæ*, with pendulous *Lycopodia* and many Ferns, *Æschynanthus*, *Hoya*, *Saccolabium*, *Scitamineæ*, and such types of the hottest and dampest climates on the face of the globe.

The Bungalow at Punkabarrie is good—which is well, as my luggage-bearers are not come up, and there are no signs of them along the Terai road, which I see winding below me. My scanty stock of paper being full of plants, I was reduced to the strait of botanizing and throwing away my treasures. The rain fell almost without intermission; and on returning from collecting in the dripping gullies along the foot of the hills, I was obliged to lie in bed half the day till my things were dry. I had no change, having only too little room in the Palkee for my long self and a few of the most valuable instruments.

In the evening, walked out again. The forest is truly magnificent along the excessively steep mountain sides. Except the *Careya*, whose abortive stamina, as well as other points in its flower, remind me of *Napoleona*, little was in blossom. *Wrightia mollissima* formed a small tree, now nearly leafless, with its curious hanging pods. The Saul is indeed a noble tree; I saw no individuals at Paras-Nath to compare with these. It is certainly the mid-winter of this region, and the apparently great proportion of deciduous trees were far more considerable than I expected; partly, probably, due to the abundance of the scarlet-fruited *Sterculia*, whose copious fruit was all the more conspicuous from the leafless condition of the plant. Mosses are far from frequent, and the Lichens are principally corticolous species. A few *Agarici* were the prevalent Fungi. Ferns, too, are more *season-plants* than I expected; the majority are showing their crozier-like heads, except a *Pteris* and *Stegania*? which appear to be perennials. The white or lilac blossoms of the convolvulus-like *Thunbergia* are the predominant feature of shrubby vegetation, and very handsome they are.

Except a prodigious quantity of large ants, of several species, I see few insects; these bite severely. Continued wind and rain all night.

On the following morning I walked up the hill on the Darjeeling road. Turning the spur of a hill, round which the path winds, a superb steep valley of the Mahanuddy is opened. All around, the hills rise five or six thousand feet, steeply, and clothed in a dense deep-green dripping forest. Torrents rush down the slopes, but their position is only indicated by the dipping of the forest into their beds, or the occasional cloud of spray rising along some more boisterous part of their course. All the hill-tops are clothed in clouds, and appear a far from inviting retreat; yet I have thirty miles to wind amongst them before I shall reach Darjeeling.

From the road, at and a little above Punkabarrie, the view is really superb, and very instructive even to so idle an eye as mine was. I send you a little sketch. Behind (or north) the Sub-Himalaya rise in the steep confused masses I have described. Below, the hill on which I stand, and the ranges as far as the eye can reach east and west, throw spurs on to the plains of India. These are very thickly wooded, and enclose broad, dead-flat, hot and damp valleys, apparently covered with a dense forest. Secondary spurs of clay and gravel, like that immediately below Punkabarrie, rest on the bases of the mountains, and seem

to form an intermediate neutral ground between flat and mountainous India. The Terai district I attempted to describe, forms a very irregular belt, scantily clothed, and intersected by innumerable rivulets from the hills, which anastomose on the flat, forming here a plexus and there a ganglion of waters, till, emerging from the region of many trees, they enter the plains of India, following a somewhat devious course, which glistens like a silver thread. The whole horizon is bounded by the sea-like expanse of the plains, which stretch away into the region of sunshine and fine weather, in one interminable, boundless flat, unbroken by any undulation. In the distance, the courses of the Teesta and Cosi, the great drainers of the back or snowy Himalayas, and the recipients of innumerable smaller rills, are with difficulty traced at this, the dry season. The ocean-like appearance of this southern view is even less conspicuous in the land than in the heavens, where the clouds are seen to arrange themselves after a singularly sea-scape fashion. Endless stratifications run in parallel ribbons over the extreme horizon; above these, scattered cumuli, also in horizontal lines, are dotted against a clear grey sky, which gradually, as the eye is lifted, passes into a deep cloudless blue vault, continuously clear to the zenith; there the cumuli, in white fleecy masses, again appear, and, turning round to view the northern celestial hemisphere, these thicken and assume the leaden hue of nimbi, till they reach the black forests of the hills, where they are discharging on my devoted head. The breezes are south-easterly, bringing that vapour from the Indian Ocean, which is rarified and suspended aloft over the heated plains, but condensed into a drizzle when it strikes the cooler flanks of the hills, and into heavy rain when it meets their still colder summits. Upon what a gigantic scale does nature here operate! Vapours, raised from an ocean whose nearest shore is more than 300 miles distant, are safely transported without the loss of one drop of water, to support the rank luxuriance of this far-distant region. This and other offices fulfilled, the waste waters are returned, by the Cosi on my right and Teesta on my left, to the ocean, and thence again exhaled, exported, expended, re-collected, and returned.

The soil consists of a clayey basis, with much decomposed gneiss. It is superficially covered with a stratum of vegetable mould, everywhere swarming with large and troublesome ants. In the evening, the noise of the great *Cicadæ* in the trees is absolutely frightful.

They burst suddenly into full chorus, with a voice so harshly croaking, so dissonant, and so unearthly, that in these solitary forests I could not help being startled.* In general character the note was very similar to that of other *Cicadæ*. They ceased as suddenly as they commenced. Enormous earth-worms and myriads of leeches were the other animalia that most struck me.

My things having not yet come up, I was detained another night at Punkabarrie, which, in the constant rain, was far from agreeable. On the following morning they did arrive, and, leaving my Palkee, I took to a pony kindly sent for me by Mr. Hodgson.

A very steep ascent, of 3,000 feet or so, commences at Punkabarrie, the road winding along the face of a steep, richly wooded, hot, and sunny valley. *Gordonia Wallichii*, from its social habit, size, straightness of timber, and colour of bark, is still the most attractive tree. The road zigzags extraordinarily in and out of the innumerable lateral ravines, each with its water-course, dense jungle, and legion of leeches. I picked twenty off my legs before I was ten minutes collecting in one of them; their bite gives no pain, but is followed by considerable effusion of blood. They puncture through thick worsted stockings, and even duck trousers, and, when full, roll in the form of a little tough ball into the bottom of the shoe, where their presence is hardly felt in walking.

(To be continued.)

BOTANICAL INFORMATION.

Elevation of the great Table Land of Thibet.

When Dr. Hooker set out upon his journey to investigate the botany and the physical character of the eastern extremity of the vast Himalaya range, Baron Humboldt was so good as to address a letter to him on certain objects which it was especially desirable he should keep in view. He there writes:—

"Que je suis heureux d'apprendre que vous allez pénétrer dans ces belles vallées de l'Himalaya, et même au-delà, vers Ladak et les *plateaux de Thibet*, dont la hauteur moyenne, non confondue avec celles des

* I hear from Hodgson that this may be a tree-frog; but the question is still open; and in either case the animal is probably undescribed, for nobody can catch it!

cîmes qui s'elèvent dans le plateau même, est un objet digne de recherche."

And in another passage :—

"Eclaircir le problême de la hauteur des neiges perpétuelles à la pente meridionale et à la pente septentrionale de l'Himalaya, en vous rappelant les données que j'ai réunies dans le troisième volume de mon 'Asie Centrale.'"

The obstacles to entering Thibet—jealously guarded as it is by the Chinese authorities, aided by Sikkim tribes occupying the southern boundaries, and who are tributaries to the Celestial Empire; and those arising from the nature of the passes, the execrable state of the roads, and the difficulty of procuring provisions and guides—have been, beyond anything, great. And it was not till after twelve months of exploratory excursions in the vicinity of the several passes, and some diplomatic tact, though of a very humble character; but, mainly through the kind exertions and the authority exercised by his Excellency the Governor-General, Lord Dalhousie; of Dr. Campbell, the Resident of Darjeeling; and Mr. Hodgson, that Dr. Hooker was able to accomplish the grand object of his ambition,—to determine the elevation of the great Thibetian Table-land. The second problem indicated by M. de Humboldt is here also solved; and we think we shall best consult the wishes of our scientific readers by laying these facts at once before them, though at the risk of repeating them in the continuation of Dr. Hooker's Journal.—Ed.

"Tungu, N.E. Sikkim.—Alt. 13,500 feet.
"July 25, 1849.

"I have carried my point, and stood on the Table-land of Thibet, beyond the Sikkim frontier, at an elevation of 15,500 ft.,—at the back of all the Snowy Mountains!

"When I wrote last, I flattered myself that the way was open, and that the Tcheba Lama's letter had removed all difficulties: it furthered me one march northward, but no more. The Singtam functionary, though well disposed towards me, was not charged to give effectual aid: he therefore declared himself profoundly ignorant of the road,—the Soubah of Lachen, ditto. There was no remedy but to arm myself with patience. So I quietly camped again, told the chiefs that we were very good friends, and sent for the instructions which the Tcheba Lama had issued, which were to the purport that I might proceed as

far as the Frontier, which I knew to be two marches ahead, on a hill, called 'Kongra Lama,' and close to a Chinese guard. The Singtam Soubah behaved courteously to me; but, to draw me away from my purpose of entering Thibet, he represented the Rajah's affection for me as boundless;—nothing but extreme solicitude for my safety possessed his breast and actuated his conduct;—if I were to be lost in a stream,—if evil of any kind befell me,—a shrine at Lhassa and annual worship were the least honours that would be decreed to my memory; *therefore* he implored me to consult my own security and return to Darjeeling, &c. The more civil he became, the more so was I. Still I declared that I was bound to say my instructions were so explicit, that I had no option but to remain where I was, waiting Dr. Campbell's (the Resident's) directions, which could not arrive sooner than twenty days. To this, my friend, well aware that our provisions had run short, grinned acquiescence. He flattered himself that he should soon starve us out; but I knew, on my side, that the Rajah had allowed to the Soubah and his coolies *only six days' food!* My camp being pitched at an elevation of 11,500 feet, I had plenty of work,—lots of new plants to gather, observations to make, and I was as busy as possible all day long, for nine or ten days. The Soubah visited me every morning, and we had long conversations; for he is an intelligent man, and has visited Lhassa, &c., and he told me frankly all he knew, and gave me much curious information. Talking, one day, of the mountain chains, I asked him for a rude sketch of those bounding Sikkim. He called for a great sheet of paper and charcoal, and prepared to make his mountains with sand. I ordered RICE to be brought for the purpose, and though we had sore little, I strewed it carelessly about. The end was answered; he stared at my unexpected abundance, and, after bidding him good-bye,—(it is the custom, as you are probably aware, to send your visitor away,)—I saw no more of my rice,—which looked ominous for the state of *his* granary. Soon after, he volunteered to take me a ride to Tungu, which everybody swore was across the border. I agreed, if my tent might go. 'He dared not allow it.' Why? because it was in Cheen (Thibet); to which I replied, that having promised not to enter *Cheen* till the directions from Darjeeling arrived, I should wait till they came. Again he was nonplussed. Well, on the tenth day of my detention, it pleased Providence to afflict my tormentor with a fit of the colic, and he could not pay me his wonted daily visit; and

as I made no inquiry, he concluded I was angry, and dared not ask me for medicine. I should tell you that the illness was caused by a quantity of wild herbs and fruits which the poor wretch had eaten, by way of eking out his slender fare. At night a servant came, informing me that his master was very bad, like to die, and exemplifying the disturbance of the Soubah's interior by twisting his fingers together and clenching them across the pit of his own stomach. I instantly sent him a large dose, and next morning my patient was on his legs, though looking wofully ill. In the gratitude of his heart, he told me that he *had heard of such a place as* 'KONGRA LAMA,' and proffered to guide me there, if I promised not to stay more than one night at Tungu. I repeated my former refusal—that I 'would not enter Cheen (Thibet) till my instructions came.' 'But,' he said, 'Tungu is not in Cheen.' 'Is it in Sikkim, then?' 'Yes, certainly.' 'Very well, since this is the case, we will all go to-morrow morning, and I shall stay there as long as ever I choose.' So he could only smile and agree.

"Samdong (which signifies *a bridge*) is the name of the place of detention where all the above battling occurred. It is about eight miles north of the Fork of the Zemu and Lachen, in a stunted forest of *Juniper* and *Abies Webbiana*. It is situated on the Lachen river. The mountains on either side are low and grassy,—swarming with rare plants. Marshy flats border the stream, and afford good yak-grazing; and I added fifty or sixty species to my collection in a very short time. Thence, north to this place, is five or six miles more, the valley becoming broader, the hills lower and still more grassy, producing an abundance of novel species.

"We went to the pass, and entered Thibet yesterday; my friend, the Soubah, acting as guide. His apologies are numberless. The Chinese, he says, had threatened to cut off his head, if he permitted any European to cross the frontier. I replied that an Englishman always carries his point, and whether in days, weeks, or months, made no difference to me. Now he vows that he will never hide so much as *that* (pointing to the tip of his little finger),—that he will show me everything, and that I must visit his wife in his black tent on the frontier. So the tables are turned, and the Bhoteas show themselves as civil, communicative, and zealous in good offices, as they previously were hostile and impracticable.

"The Pass is about ten miles north of the place whence I write. We

had Thibetan ponies, and I must describe my feats, mounted thereon, *à la Tartare*, on another occasion. I walked, however, good part of the way, collecting lots of new plants, of Thibetan types. Above this place, the Lachen river, which we followed, is bounded by two stupendous mountains, its bed being immediately margined by flats and low stony or grassy hills. A little *Juniper* and *Rhododendron* accompanied us for a short way; beyond, all was short turf and stones, marshy flats and rocky spurs; the vegetation scanty, but very varied. The Thibetans come over the frontier in summer to feed their yaks, residing in black horse-hair tents. We saw two of them, and I stopped and entered one, which was empty, except a fine Chinese-looking girl—a jolly laughing wench, who presented me with a slice of curd. These people make butter all the summer, and eat curd with herbs, milk, and Fagopyrum bread. The richer sort only can afford to purchase rice. They have two sorts of churn. One is a goat skin, in which the cream is enclosed, and beaten, stamped upon, and rolled. The other is an oblong box, a yard in length, full of upright *Rhododendron* twigs, beautifully frosted with butter, but all alive with maggots. The tents are roomy and water-tight, though of so loose a texture as to be pervious to wind and smoke. Some miles further, we reached the tents of Peppin (the Lachen Soubah), and were most graciously received by his squaw and family. The whole party squatted in a ring inside the tent, myself seated at the head, on a beautiful Chinese mat. The lady of the Soubah then made tea (*brick*-tea), with salt and butter, and each of us produced our Bhotea cup, which was always kept full. Curd, parched rice, and beaten maize, were handed liberally round, and we fared sumptuously, for I am very fond both of brick-tea and curds. Our fire was of juniper-wood, and the utensils, of clay, were moulded at Dijarchi, except the Bamboo churn, in which the tea, salt, and butter, are churned previous to boiling. Meantime, my poor dog Kinchin, who stood fastened outside, kept up a furious baying at a huge Bhotea dog, a most noble animal, who longed to demolish my faithful Argus. Presently a tremendous peal, like thunder, echoed down the glen. My followers started to their feet, and cried to me to be off, for the mountains were falling, and a violent storm was at hand. We pursued our way, for five or six miles, in thick fog; the roar of the falling masses, from Kinchin-jow on one hand, and Chomoimo on the other, being literally awful; I never heard anything the least like it, except claps of

heavy thunder. Happily, no fragment can, by possibility, enter the valley, by reason of the low hills which flank the river, along whose bed we pursued our way. Violent rain soon ensued, and drenched us to the skin. Gradually, as we ascended, the valley widened, and at 15,000 feet we emerged on a broad, flat table-land; it might rather be called range after range of inosculating, flat, stony terraces, with a little herbage, amongst which the Lachen river meandered. Five hundred feet further, and we found ourselves on the top of a long flat ridge, connecting the N. W. extreme of Kinchin-jow with Chomoimo, and here stood the boundary-mark—a Cairn!

"Happily, the weather cleared, and enabled me to look about. North, the plateau dipped, by successive very low ridges, overhung with a canopy of the vapours that had deluged us. Easterly, was the blue sky and low ridges of the lofty table-land, which here backs the great range. To the west, the spurs of Chomoimo and much mist hid the horizon. South-east, Kinchin-jow, a flat-topped mass of snow—alt. 20,000 feet—rose abruptly, from low rocky cliffs and piles of *débris*. South-west was Chomoimo, equally snow; while to the south, between these mountains, the plateau dipped into the funnel-mouthed head of the Lachen valley. So here, at last, after three months of obstacles, I stood at the back of the entire Himalaya range, and at its most northern trend in the central Himalaya; for this spot is far north of Kinchin-junga and Chumalari, or the Nipal Passes, which I visited last winter. It opens directly upon the Thibetan plateau, without crossing a snowy ridge to be succeeded by other and still other snowed spurs, as is the case at Kanglachen and Wallonchoong.

"Here, too, I solved another grand problem—the elevation of the snow-line. Strange to say, there was not a particle of snow to be seen anywhere, *en route*, right or left, nor on the great mountains for 1,500 feet above my position. The snow-line in Sikkim lies, on the Indian face of the Himalayan range, at below 15,000 feet; on the Thibetan (northern) slope, at above 16,000! I felt very much delighted, and I hastily made a rude panoramic sketch of the scenery around me, on four folio sheets of paper, very rough, as you may suppose, for the keen wind blew a gale and we were quite wet. Above 15,000 feet, too, I am a 'lost man'; my head rings with acute pain, and feels as if bound in a vice; my temples throb at every step, and I retch as with sea-sickness.

"Just above 15,000 feet all the plants are new; but the moment you reach the table-land, nine-tenths of them disappear; and on the almost bare earth, a *Potentilla*, *Ranunculus*, *Morina*, *Cyananthus*, a Grass, and a *Carex* are nearly all the vegetation that is seen. There is no Dama (*Caragana*) nor *shrubby Astragalus* in this part of Thibet, as in the north-west; and the *Trichaurus*, which is found at 12–13,000 feet on the Indian approaches to Thibet, did not ascend to the top of the Pass. Still, as I always expected, at the turning-point, where the alpine Himalayan vegetation is to be soon replaced by Thibetan sterility, there is a sudden change in the Flora, and development of species which are not found further south, at equal altitudes in the Himalaya. For example, I gathered ten *Astragali* in the last five miles, and eight *Ranunculi*, six species of *Pedicularis*, several *Fumariæ* and *Potentillæ*, all new to me, and at between 14,500 and 15,500 feet. We made a fire of yak-dung, dried, and blew it up with bellows of goat-skin, armed with a snout of yak's horn. My poor shivering Lepchas were benumbed with cold, and I gave them my cloak, for I always go thickly clad. I staid an hour and a half on the Thibetan side of the frontier, and I got good barometrical observations, and others with boiling water; but the latter is infinitely the more troublesome process.

"On our return the weather cleared magnificently, and the views I obtained of the great mountains above named, rising almost perpendicularly, excelled anything I ever beheld. For 6,000 feet they rise sheer up, and loom through the mist over head, their black wall-like faces patched with ice, and their tabular tops capped with a bed of green snow—I am afraid to say how thick, but I should guess between two and three hundred feet in thickness. Southerly, down the glen, the mountains sank to low hills, to rise again, in the parallel of the great chain, twenty miles south, to perpetual snow in rugged peaks. We stopped again for a few minutes at Peppin's tents, to get some tea; and at dusk I took horse, for, alas! I am quite blind in the dark. The stubborn, intractable, unshod Tartar pony which I rode, never missed a foot: sharp rocks, deep stony torrents, slippery paths, and pitch-darkness, made no difference to him. Except when in movement, these ponies are sorry-looking beasts; but the Singtam Soubah, who weighs full sixteen stone, rode his down the whole thirty miles of rocks, stones, streams, and mountains; and except to stop and shake

themselves, like a dog, with a violence that nearly unhorsed me, neither his steed nor mine exhibited any symptom of fatigue.

"I should like to stay here for some time, but it is impossible to have food sent to me. The road between this place and Choongtam is so bad that the coolies can carry little more than each man his own daily provisions and blanket.

"The unlucky Singtam Soubah is in an agony to be off, and as I shall go from Choongtam to the Lachong Pass, not twelve miles east of this pass, I may probably find there the same plants; but I fear that pass has an elevation of 17,000 feet (and then, woe is me, for my poor head and stomach!), and also that it does not *débouche* upon, but descends to, this same plateau, ten or twelve miles east of 'Kongra Lama' and of Kinchin-jow. The road from Choongtam is good. Fever rages below, from Choongtam to Darjeeling. My people behave admirably, and I never hear a single complaint; but I find it very hard to see a poor fellow come in, his load left behind, staggering with fever, which he has caught by sleeping in the valleys on the way from Darjeeling; eyes sunk, temples throbbing, pulse at 120, and utterly unable to call up the merry smile with which the kind creatures always greet me. Generally, I have no difficulty in bringing my patients round with quinine and calomel, in this region. Here, of course, and for two marches below Choongtam, there is no danger, and with a little exertion and due precaution, my people might avoid illness; but though I warn every one, when starting for Darjeeling, and Campbell does the same when sending them back to me, they are so heedless that they pay no attention, and recklessly sleep in the most pestilential holes in Sikkim,—places where no consideration should induce me to stop. As for myself, my work is not half finished—I mean my botany, though I am busy, collecting and drying, from morning till night, and giving little time to anything else.

"We have almost no rain here, but much mist, and I find great difficulty in keeping my plants in order: happily, they are small. I do not expect to return to Darjeeling till September or October, and perhaps not then; so you need not be alarmed about fever, for I shall not descend below 6,000 feet; indeed, I have not been below 10,000 feet for the last two months. I have led a hard but a healthy life, and I know not what it is to spend a lonely-feeling hour, though I have not a soul to converse with. Labelling plants and writing up my journal

are no trifling labour, and I am incessantly at work. It is a long while since I received any home letters. I am at a great distance from Darjeeling, and my post is often twenty days in reaching me from thence. I mean to remain in this place a few days, and then descend leisurely to Choongtam." "J. D. HOOKER."

Mr. Spruce's Voyage to Parà.

Our readers will be glad to learn that Mr. Spruce, whom we had announced as on the point of embarking on a botanical voyage up the Amazon River, has safely reached Parà, after the extraordinarily quick passage, in a sailing vessel, from Liverpool, of only thirty-five days. "I write a hasty note," Mr. S. says, on the 13th July, dated Parà, "to inform you of our arrival. We made the port of Parà yesterday (the 12th) about 10 o'clock, P.M., after a splendid run of thirty-five days; while the Windsor, which sailed *eighteen days before us*, arrived here only this morning! Notwithstanding our short passage, we were becalmed eight days in the tropics, between losing the N. E. trades and falling in with the S. E. trades; and a dreary time we poor passengers had of it; though we perhaps could not have had a better introduction to the heat of the tropics, and we shall scarcely ever suffer more from the same cause. In coming up the Rio Parà by night, with an ignorant and drunken pilot, we struck on a sunken rock, which took us about midships, while we had deep water at both stem and stern; and there we lay, with the ship almost on her beam-ends, a tremendous tide running, which threatened every moment to cant us over, though, happily, at the end of three anxious hours it floated us off in safety.

You will not expect much information about plants. I strolled out this morning before breakfast, and fell in with a few of the characteristic plants of this coast. On the river-banks are some Amaryllises, in flower, some large *Cyperi*, &c. In waste places trails a pretty *Ipomæa*. A suffruticose *Verbena*, one of the Brazilian "teas," grows everywhere on ruinous walls. By the river, the walls of soft sandstone are clad with a moss resembling *Trichostomum Barbula*. A species of *Manihot* (not the real *Mandiocca*) grows everywhere, and two or three other pretty Euphorbiaceous plants. However, I mention this

only to show that I have not lost the use of my eyes during the voyage; although we all suffered from being cooped up in so small a ship and in weather so hot as we have had.

"I must not omit to say that we have been most kindly received by the Campbells, who entreat us to make our home with them so long as we remain at Parà. Mr. Miller, too, Mr. Singlehurst's partner, has offered us his Rosinha, if we choose to occupy it. It is a little out of the town, and we may possibly accept his generous invitation after we have seen what the immediate vicinity affords.

"The rainy season is not quite over. The best month for ascending the streams is October, and I will try to ascertain before that time which is the most promising and accessible field. The weather is very fine—no rain falls before two o'clock in the afternoon; true 'faz calor immenso,' but *that* I was prepared for, and I trust soon to become accustomed to it.

"I determined the ship's position by observation almost daily during the voyage, and I kept also a register of the barometer and thermometer. I should be much obliged to Admiral Beaufort if he would send me out a map of the stars. I shall be glad to be remembered to my botanical friends in your neighbourhood. Tell Dr. Lemann that nothing can exceed the magnificence of the forests on the shores and islands of the Amazon. It is *here* he should come to see what a Brazilian forest is. I had no idea trees could grow to such a height or assume such imposing forms, and I have as yet had only an *outside* view. The trees around Parà alone would furnish work for six months.

"I am thankful to have to say that both myself and companion are in passable health. The *carapanàs* have sung around us, but have not yet ventured to try the strength of our skins,—that is a treat yet to come."

Another letter, dated Parà, 3rd August, gives the following information:—

"I seize the opportunity of the Britannia sailing for London, to tell you how I am getting on. In two or three days after our arrival here we set seriously to work on our dried collection, and we have now several hundred specimens dried and drying. In the way of living plants I have made a beginning. I have sowed the seeds of two Palms, and hope shortly to get the ripe fruit of some others; I have also

flowers and fruit of three species hanging up to dry. I have met with five or six *Orchidaceæ*, the larger ones out of flower; but two small ones in flower, one a pretty *Fernandesia*, most likely *F. lunifera*, the other with small sweet-scented yellow flowers. I am anxious to get to new ground, and I would go up the river at once, but this is such slow work, that I should be unable to get down again with my collections in time to despatch them, so as to reach England before the setting in of winter. In consequence of this, I have decided to accept Mr. Archibald Campbell's invitation to visit two of the islands in the river, where he has some property, and which have been explored by no botanist. These are Caripé and Tanau. In the former a deposit of fossil shells has been found quite recently, which I am anxious to see. Some time in the month of September I hope to send off my collections to England, and immediately after to set off up the river for Mont' Alegre, on the north bank, which is spoken of as a good station from which excursions can be made up the country. The hills, too, about Mont' Alegre itself, are seen from the Amazon at a distance of twenty miles. I should like to devote the remainder of the year to Mont' Alegre and the north shores of the Amazon, or even to prolong my stay there a little way into the rainy season, and then return to Parà, to remain until dry weather again commences.

"The Ferns around here interest me much, especially the minuter epiphytal ones, and I gather all I find in good condition; but of all the Cryptogamous tribes, *Hepaticæ* seem most to flourish here, covering the trunks, branches, and even leaves of the trees in the dense virgin forests. The Mosses and Lichens, too, are numerous and beautiful. These are none of them overlooked, as you may well suppose, knowing my previous propensities; but they are mostly laid down to dry in the lump, and await a season of more leisure for their being examined and portioned into specimens. I have met with abundance of the *Drepanophyllum*, though hitherto only in a barren state,—and with both the *Octoblepharums* in copious fruit.

"I cannot specify the phanerogamic families in which I have done most;—*Leguminosæ*, *Melastomaceæ*, *Clusiaceæ*, &c., will include the most interesting of my exogenous collection. The islands are said to possess a more varied and untouched vegetation than the main land, and I hope, when I return from them, which will be some time in September, to have several living plants and a large lot of dried speci-

mens to send home. Peppers and *Aroideæ* abound here, but the latter are such monstrous things that I scarcely know how I shall send them alive. There are several sorts of *Mandiocca* cultivated here, and I propose sending you plants of each."

We may here state, what the Subscribers to Mr. Spruce's dried collections will learn with satisfaction, that Mr. Bentham has kindly undertaken to name and distribute them; to be delivered in London, free of charge, at the price of £2 the 100 species. Applications may be made to G. Bentham, Esq., Pontrilas House, Hereford.

We have reason to believe that Mr. Spruce will provide separately sets of *Ferns*, *Cyperaceæ*, and *Grasses*, for those who may desire them exclusively.

Appointments to Colonial Gardens.

The Chief Secretary for Colonial affairs, Earl Grey, has been pleased to appoint G. H. K. Thwaites, Esq., to be the successor to the late Mr. Gardner, at the Botanic Garden of Peradenia, Ceylon, and a more fit person could not have been selected; and Mr. Duncan to succeed Mr. Newman at the Botanic Garden, Mauritius.

It will not be out of place here to mention that M. Pancher, who was Director of the "Atelier des Graines" at the Jardin des Plantes at Paris, is gone out to Otaheite, as Government Gardener there for the French Republic.

Bread-fruit Tree flowering in England.

It is well known that, at the last Chiswick Horticultural Show, were exhibited by Mr. Iveson, Gardener to Her Grace the Duchess Dowager of Northumberland at Syon, the following very rare ripe tropical fruits, the produce of the stove there, viz., *Nutmeg*, *Chocolate*, *Vanilla*, *Allspice*, *Cloves*, *Gamboge* (at least one kind, *Xanthochymus pictorius*, Roxb.), and *Papaw*; and now we have the pleasure of being able to state that the Bread-fruit (*Artocarpus incisa*) in the same conservatory is bearing its two kinds of flowers, and with every prospect of the fruit setting, assuredly for the first time in Europe.—We may here add, too, that a fine tree of *Mango*, in the great new stove of the Royal Gardens of Kew, is at this moment ripening fourteen well-formed fruits.

Museum of Practical, or Economic Botany, at the Royal Gardens, Kew.

The contributions of friends have materially enriched this collection within the last few weeks. Among some of the more interesting additions we may mention specimens of diseased timber (whether occasioned by insects or other causes); and what, at first sight, seem rather to belong to the animal than the vegetable kingdom, splendid specimens of the nests of hornets and wasps, all presented by the Rev. Professor Henslow: these latter objects are truly *paper*, made by the insects of *vegetable* fibre. A case is filled with the several implements employed by the native Indians of Madras in preparing toddy from the Toddy-Palm. This will soon be illustrated in our Journal by a plate from a drawing presented at the same time with the implements, the gift of J. W. Strachan, Esq., of Teddington Grove. Dr. Hooker has sent from Patna a series of drawings illustrative of the cultivation and preparation of *opium*; and there is now on its way a considerable collection of objects explanatory of the manipulation of that drug, of which we shall take further notice by and by; and Dr. Pereira has generously added considerably to the pharmaceutical collection. A large case is about to be entirely filled with the products of *flax*, exhibiting the different stages of preparation, and the beautiful textile fabrics now so largely manufactured in Ireland; the combined gifts of the "Royal Society for the promotion and improvement of the growth of Flax in Ireland," and of Messrs. Storar and Co. of London.

The Museum is anxious to possess as complete a collection as possible of *paper*, manufactured from different vegetable substances, in all parts of the world. The variety of plants that subserve to paper-making, throughout the world, is quite remarkable; and a full set of such papers would be extremely interesting and instructive. We trust our intelligent travellers will aid us in this department, taking care to ascertain the name, or to provide a specimen, of the plant which yields the respective tissues.

Projected Flora of Corsica.

Monsieur Alfred Moquin-Tandon, the talented author of nearly the

whole of the 13th volume, sect. 2, of DeCandolle's "Prodromus" (*Phytolacceæ, Salsolaceæ, Amaranthaceæ*), &c., in conjunction with the veteran botanist, M. Requien of Avignon, is, we understand, preparing a Flora of the Island of Corsica. Such a work could not be in better hands.

Plants of Candia and of Greece.

Mr. Theodor von Heldreich (from Athens) is at this time in London, directing the distribution of his extensive collections of Oriental plants. The most recently gathered are a very fine set from Candia, and another from Greece. Amongst them are some entirely new species, and many of great rarity, and some of Sibthorpe's scarcest kinds. All are correctly named, and arranged according to the system of De Candolle. Our own set consists of 785 species. Besides the specimens, we are favoured by M. von Heldreich, for the Museum at the Royal Gardens, with a portion, nearly four feet long and three inches in diameter, of a stem of the true Ναρθηξ of Dioscorides (*Ferula communis*), or the *Ferula* of the ancients, and of which it is remarked by Tournefort that it preserves its old name among the modern Greeks, who call it *Nartheca*. "It bears a stalk," continues that author, "five feet high and three inches thick. At every ten inches there is a knot, and it is branched at each knot. The bark is hard, two lines thick: the hollow of the stem is filled with a white medulla, which, being well dried, takes fire like a match. The fire holds for a good while, slowly consuming the pith, without injuring the bark, and the stem is therefore much used for carrying fire from place to place. Our sailors laid in a store of it. This custom is of the highest antiquity, and may explain a passage in Hesiod, where, speaking of the fire that Prometheus stole from Heaven, he says that he brought it in a *Ferula*:—the fact being, probably, that Prometheus invented the steel that strikes fire from flint, and used the pith of the *Ferula* for a match, teaching men how to preserve the fire in these stalks. The stem is strong enough to be leaned upon, but too light to inflict injury in striking; and therefore Bacchus, one of the greatest legislators of antiquity, commanded that men who drank wine should carry staves of this plant, with which they might, during intoxication, smite each other, and yet not break heads. The Priests of this Deity supported themselves on sticks of *Ferula*, when

walking. Pliny observed that while it is greedily eaten by asses, it proves rank poison to other beasts of burthen; but we had no opportunity of testing this point, for sheep and goats were the only quadrupeds on the island.

"The plant is now chiefly employed for making low stools. The dried stalks, being placed alternately in length and breadth, form cubes, which are fastened at the four corners with pegs of wood; and these cubes are the visiting-seats of the ladies of Amorgos. Very different was the use to which the ancients applied the *Ferula!* Pliny and Strabo relate that Alexander kept Homer's work enclosed in a casket of *Ferula*, because of its lightness. The body of the casket, being made of this plant, was covered with rich stuff or skin, adorned with ribs of gold, and studded with pearls and precious stones."

In Sicily, the pithy stems are employed as natural tinder-boxes.

Appointments to Natural History Chairs (including Botany) in the Queen's Colleges, Ireland.

Belfast.—We are happy to learn that Dr. Dickie, Lecturer on Zoology and Botany in the University and King's College, Aberdeen, and author of numerous contributions to Botanical Science, published in various scientific periodicals, has received this appointment; while to that of *Cork*, William Hinkes, LL.D., is announced; and to *Galway*, A. G. Melville, M.D., formerly Demonstrator of Anatomy to the University of Edinburgh.

NOTICES OF BOOKS.

GENERA FLORÆ AMERICÆ *Boreali-orientalis Illustrata. The Genera of the Plants of the United States, illustrated by figures and analyses from nature, by* ISAAC SPRAGUE; *superintended, and with descriptions,* &c., *by* ASA GRAY, M.D., &c. Vol. ii., plates 101–186, royal 8vo. New York, 1849.

We hail with peculiar pleasure the second volume of this very important work: important, not only to the American Botanist and the

student of American botany, but to botanists in general, as illustrating very many genera common to other countries as well as to the United States, and executed with a degree of accuracy and talent only elsewhere to be met with, as we have already remarked, in the works of Endlicher, and of Theod. Fred. von Esenbeck. We hail its appearance, too, as an indication of the success the first volume has met with; and the better it becomes known, the more highly it will be appreciated. The arrangement is that of De Candolle, with slight alterations. An entire leaf is devoted to the character of each genus, and one, and sometimes two plates, if the analysis requires them.

The volume commences with *Caryophyllaceæ*, comprising *Mollugineæ*, *Sclerantheæ*, and *Illecebreæ*, and including fifteen genera; and these pages are not devoted to dry descriptions, but the affinities of the families and the genera are discussed in a masterly manner, and the properties and uses of the genera and species belonging to them. *Malvaceæ* follows, with fifteen genera; *Byttneriaceæ*, two; *Tiliaceæ*, two; *Ternstrœmiaceæ*, two; *Linaceæ*, one; *Oxalidaceæ*, one; *Zygophyllaceæ*, five; *Geraniaceæ*, two; *Balsaminaceæ*, one, with two illustrative plates; *Limnanthaceæ*, two; *Rutaceæ*, one; *Xanthoxylaceæ*, two; *Ochnaceæ*, two; *Anacardiaceæ*, one, two plates; *Vitaceæ*, two; *Rhamnaceæ*, seven; *Celastraceæ* two; *Staphyleaceæ*, one; *Malpighiaceæ*, one; *Aceraceæ*, two; *Sapindaceæ*, five, seven plates; *Polygalaceæ*, one, two plates; and lastly *Krameriaceæ*, with two plates. Neither the author nor the artist has spared pains to make the work perfect of its kind, and worthy of a place in the library of every man of science, and especially every student of plants;—worthy of a much longer notice, too, which will shortly appear in the pages of this Journal.

THOMAS G. LEA'S *Catalogue of Plants, native and naturalized, collected in the vicinity of Cincinnati, Ohio, between the years* 1834–1844. Philadelphia, 1849.

Botany is making rapid progress in North America, as is evinced by the appearance of local Floras. The present little volume, though called a *Catalogue*, is more than that; for, besides containing an accurate list of Phænogamous plants and Ferns, and perhaps a less complete one of Mosses and Hepaticæ, there are, among the Lichens, several

new species, with remarks by Mr. Tuckerman; while among the rich catalogue of Fungi drawn up by the Rev. M. J. Berkeley, are many new and remarkable species from that gentleman's pen. The zealous author of the Catalogue died of fever at Waynesville, State of Cincinnati, before the work could be printed. Mr. James M. Lea, son of the author, and Dr. Asa Gray, have conducted it through the press.

KUTZING, FREDERIC TRAUG: *Species Algarum.* 8vo. Leipzig, 1849.

This is a synopsis of all the known genera and species of what are now generally considered to come under the denomination of *Algæ*, by one who has already laboured much and successfully in this field. The *Algæ*, usually esteemed a family or order in themselves, are here divided into, 1st, *Classes*, 2nd, *Sub-classes*, 3rd, *Tribes*, 4th, *Orders*, 5th, *Families*, and lastly, *Genera* and *Species*. The genera exceed 396; but we fear that, with only *brief* characters of the divisions and subdivisions, and of the genera and species, with no diagnoses and no descriptions, the Tyro can make little if any use of such a work, unless he has the means of referring to the numerous figures cited, especially in the "*Phycologia generalis*." We are, however, greatly indebted to the learned author for thus bringing together and arranging systematically the multitudinous species of marine and fresh-water *Algæ*. Closely printed, and averaging perhaps nine species on a page, the work yet extends to 900 pages.

WALPERS: *Annales Botanices Systematicæ.* Vol. i. 1848–1849, Leipzig.

The first Number of this was announced at p. 29 of our present volume; and we have now the satisfaction of being able to say that the volume is completed in 1127 pages, including a full Index of the *Orders*, *Suborders*, *Genera*, *Sections*, *Species*, and *Synonyms*. It is, as already stated, a supplement to the learned author's "Repertorium," and contains all the phænogamic plants which were published in a multitude of works, as far as he had access to them, which appeared during the years 1846–1847. Should the state of public affairs in Germany permit, a second volume, embracing the plants published during the years 1848–1849, is promised early in the following year.

GENERA FLORÆ AMERICÆ BOREALI-ORIENTALIS ILLUSTRATA: *the Genera of the Plants of the United States, illustrated by* ISAAC SPRAGUE, *with descriptions, &c., by* ASA GRAY, M.D. Vol. 2.

We announced in our last part the appearance of this second volume of the present beautiful work, the first of which we had previously noticed in the 'London Journal of Botany,' vol. vii. p. 390. We there made some extracts from the preface, showing the plans and intentions of the authors. These have been so well carried out in the two volumes before us, and the progress of the work (we understand the third volume is already far advanced) affords so good a pledge of its steady prosecution, that we are induced now to enter into some further details on an undertaking, of so much importance, not to American botanists alone, but to all those who are in any degree interested in general systematic or descriptive botany.

Since the great increase of the number of the species has rendered it a hopeless task to include in one work figures of all known plants, which was attempted by many botanists before Linnæus, the great aim has been to give representations of at least every genus. This was accomplished in a great measure by Lamarck in his 'Illustrations,' attached to the French 'Encyclopædia.' But even long before its completion, his work, however useful it may have proved, had become quite out of date, whether in design and execution, or in point of completeness. Since then, the only attempt at a general 'Genera Illustrata' has been Endlicher's 'Iconographia,' which, however, only reached a hundred plates out of above six thousand phænogamic genera then known.

It being now clear that such a task is too great for the powers of a single individual, as well as for the purses of a sufficient number of purchasers to give hopes of its being carried through, the plan has been still further restricted, and it has been the endeavour to bring within manageable limits the genera indigenous to particular botanical regions. The example was set for Central Europe by Theodore Nees von Esenbeck, in his admirably executed 'Genera Plantarum Floræ Germanicæ;' but after having been continued through above 400 plates, and having been twice abandoned in consequence of the death of the authors, and as often resumed by an equally competent successor, it appears now to have been finally put an end to by the misfortunes and death of the third manager, as well as by the political state of

Germany, which has given a sad blow to the pursuit of natural history in that country.

The work of Messrs. Gray and Sprague appears under much better auspices. We have heard that it is liberally aided by the local government; and we are confident that it will receive from the public in this country, as well as in America, that further support, without which an original work of the kind cannot be continued, and that in the course of a few years we may see it brought successfully to its conclusion.

In regard to the plates, the great merit both of the American and of the German works is their *originality*: the drawings and analyses are in almost all, if not in every instance, taken from specimens either fresh or dried, and not copied from others. In both, the plates are executed in line-engraving on lithographic stone,* an art admirably suited for representing analytical details with clearness and accuracy, without the great expense of engraving on metal. It was first practised at Munich, many years ago, and is, perhaps, best known to our botanists by Martius's splendid botanical illustrations, and from Munich it has been carried out to America by Mr. Presteb. In England it is but little, if at all exercised; either because of the expense of the stone itself, or on account of the loss and difficulty experienced in replacing any established process by a new one, whatever be its intrinsic advantages.

In comparing the execution of the two works we cannot refrain from quoting the following impartial criticism of a distinguished German botanist in Mohl and Schlechtendahl's 'Botanische Zeitung.' "The two works differ in this, that the German one, with a more fragmentary general representation of the plant, gives a greater number of partial analyses, and thus, as it appears to us, crowds them too much on the plate; whilst the North American one gives a more complete figure of the species, and analyses only of the most important characteristic organs, by which means, as well as by better paper and impression, the plates gain much in elegance, clearness, and synoptical representation of the plant; more especially as, wherever the single octavo plate has been insufficient for its proper illustration, a double plate, or two separate plates are given."

There is one point which appears to us to have been generally at-

* Not on *steel*, as is stated by mistake in our first notice of the work.

tended to in the American work, but occasionally (although not frequently) lost sight of in the German one, and to which we would call attention, on account of its importance in illustrating the details of the fruit and seed: this is the vertical position of the analyses on the plate, which should always be that which they have in nature, or rather according to a generally admitted conventional nature. Whether the flower itself be erect or drooping (a character sufficiently indicated in the general figure), the point of attachment of each *primary organ* (that is, of each organ proceeding from the main axis of the flower) must be considered as its base, and the organ, *when isolated*, represented as erect from that base. In the seed, on the contrary, where the relative position of the embryo, radicle, &c., to the fruit is as essential as that which it bears to the point of attachment of the seed, all the parts, whether isolated or not, should be represented in the position they would occupy supposing the fruit to be erect. In those cases where all the seeds of a fruit are naturally horizontal, and it is necessary to represent them seen from above, it is always best to draw them with the point of attachment *on one side*, and neither erect nor inverted. So in the diagrams or plans of arrangement, the posterior side next the axis of inflorescence should be uppermost, and the anterior, next the subtending bract, below; or if the flower be terminal, having, consequently, no anterior and posterior side, the two last bracteolæ should be right and left.

In the text, the parallel between the two works ceases. In the German, it is a detailed description of the genus, with a few occasional observations; whilst the American text gives us a comprehensive Genera Plantarum of the United States Flora, conceived according to a plan which appears to us admirably suited to all general works of the kind, and executed with the ability and care which its distinguished author has shown in all his publications.

According to the systematic plan alluded to in our former notice, a short Latin character is appended of each *natural order*, followed by a judiciously restricted synonymy and references, a general view in English of the affinities, geographical distribution, and properties, adding, in the case of the more extensive families, a more detailed development of the more important characters, with discussions on morphological and other points, to which we would specially call attention, on account of the critical acumen which they display, and the impor-

tant views which they in some instances develope. In the larger families we have also frequently a general conspectus of the tribes and genera.

Each *genus* has, after the short Latin diagnostic character and synonymy and Anglo-American name, a detailed English descriptive character with the etymology of the name, geographical distribution, and occasional notes on properties, affinities, and morphology, wherever, from their exceptional character, or from our little acquaintance with other genera, they could not be given generally under the natural order to which the genus in question belongs. And here we would advert to the great additional value the character and descriptions derive from the able assistance afforded by the botanical knowledge of the artist who made the drawings, to the botanist who compiled them from the examination of the specimens; thus establishing a double safeguard against the perpetuation of those errors which, originating in ignorance, carelessness, or even errors of the copyist or of the press, have been transferred from work to work, until at length some one, finding that a plant does not agree with its received generic character, founds a new genus on points really common to all the species of the old one. We need only refer to such instances as the ovary of *Viburnum*, the glands of *Sesamum*, the æstivation of *Annonaceæ*, &c.

These *Annonaceæ* are the only instance in which we have detected a partial oversight of the kind in the North American 'Genera.' It is stated, vol. i. p. 65, that "the Order very closely accords . . . with *Magnoliaceæ*, from which the valvate æstivation and the ruminate albumen essentially distinguish it," and in the ordinal character *æstivatione valvatâ* is printed in italics as a most important circumstance. We find, however, in the genus *Asimina*, Plate 26,* the æstivation correctly represented as it is described, p. 67, "rather imbricated than truly valvate." It is, in fact, more or less imbricated in nearly the whole, if not in all true species of *Uvaria*, *Unona*, *Guatteria*, *Duguetia*, and some others—that is, in at least half the order—although universally described as valvate in all ordinal characters of *Annonaceæ* known to us. In many instances the overlapping of the three petals of each series is as evident as in many *Magnoliaceæ*. The real positive distinction between the orders is, so far as at present known, confined to the form of the albumen; whilst the texture of the petals gives to each order a peculiar

* Plates 22 to 27 are in our copy numbered, by mistake, 27 and 22 to 26.

facies which prevents their being confounded together even at first sight.

The diagrams, or plans of arrangement of the several parts of the flower, are of great importance, and very carefully executed, and the position in relation to the axis of inflorescence is generally described as well as represented in the plate; but we should have wished to have seen it adverted to in the text in the case of *every* natural order or exceptional genus. Where, indeed, every flower is strictly terminal, as in the centrifugal cyme, there are no really anterior and posterior parts of the flower; but in these cases it is necessary to mention the fact, in order to prevent the not uncommon error of mistaking the elongation of a lateral branch for the true axis of inflorescence, and describing the position of the parts in relation to that supposed axis; whereas in the dichotomous cyme it varies, in fact, according to which of the two branches is the one taken as the axis.

Attention has been generally paid in this work to a curious circumstance which has only lately attracted in any degree the observation of botanists, that is, the disposition shown by several plants to produce two kinds of flowers on the same stem, the one perfect and showy, though often sterile, the other minute, and apparently very imperfect, but producing seeds with much more readiness. See *Helianthemum*, t. 87, *Impatiens*, t. 153 (where the minute flowers afford much assistance in explaining its morphology), &c. In one instance, however, *Viola*, t. 80, the imperfect fertile flowers have been overlooked in the description; although the capsules figured no. 10 and 11, with their short hooked styles, are derived from them and not from the showy flowers with elongated styles, figs. 3, 4, and 8.

Among the important contributions to Systematic Botany in these volumes, we would specially refer to *Malvaceæ*, many of the genera of which are remodelled upon a much more scientific basis than has yet been done, although the labours of Kunth, St. Hilaire, and others, had in a great degree prepared the way. The morphology of this, as well as of some other orders, is also developed in a much more satisfactory manner than usual; although, for our own parts, we cannot coincide in the general adoption of the modern theory and name of *deduplication*, to explain what appears to us a variety of processes, however they may tend to a common result.

The term *dédoublement* originated, we believe, with two Montpellier

botanists of well-deserved reputation, who have paid much attention to theoretical morphology, Professor Duval and his pupil, Professor Moquin-Tandon, and was first applied to the case of floral envelopes which appear to have a tendency to separate into two layers, an inner and an outer one, and thus to *unline,* as it were, which may be given as the literal meaning of the word *dédoubler* ; but it has been gradually extended to all cases where any number of floral organs occupy the place normally taken by a single one. This phenomenon, which has only recently been generally comprehended, and is particularly attended to by Dr. Asa Gray, is of great importance in explaining the morphology of the flower ; but we think that the mode in which it takes place is far from being satisfactorily explained by the statement that it is always by *deduplication.*

In a normal regular flower, it is universally admitted that each sepal, petal, stamen, and carpel is an axile appendage of the same morphological nature as the stem-leaf, and to which we therefore morphologically extend the term *leaf.* Therefore, in investigating the various anomalous developments which we observe in any one set of axile appendages, we must carefully compare them with analogous anomalies of the leaf in every one of its forms, from the stem-leaf to the carpel.

Ordinary stem-leaves show a very strong development of the vascular system in the shape of petiole, ribs, and veins, and in many instances a great readiness to produce from it convex or scutelliform glands.* These occur most frequently at the top of the petiole or near the base of the limb, one or more on each side, or on the surface of the petiole or principal veins near the base of the limb : they are also found occasionally at the end of the midrib or lateral veins, or will break out irregularly at any part of the petiole, ribs, or veins. The general surface of the leaf will only produce hairs, aculei, or other appendages of the cellular tissue, except in cases of disease or monstrosity, where an extraordinary flow of sap will induce the formation of foliaceous appendages or regular buds on the margin or on any part of the surface. But as these cases are as frequently further departures from what may be termed the normal state, as approaches to it, great care should always be taken in adducing them in support of morphological theories.

* We advert to the true glands, which always appear to be in close connection with the vascular system, not to those vesicles of essential oil scattered through the cellular tissue, which are also designated by the name of glands.

As we approach the flower a gradual change takes place in the leaf, and, more especially, in its size; but still we have even an increased preponderance of the vascular system and its glands; in some cases the bracts being reduced to a mere stalk, with one or two large glands. But when we come to the floral envelope, a sudden change takes place, not only in their position on the axis, but in their texture; the vascular system, especially in their petals, is reduced to extreme tenuity, and the cellular tissue is proportionately more developed. Glands, in their ordinary form, become rare, or are variously deformed, assuming, frequently, very irregular shapes and a petaloid consistence. In the leaves forming the *andrœcium*, a partial return to the system of stem-leaves takes place, inasmuch as the filament is entirely reduced to the vascular system, its glands are converted into anthers, and the cellular parenchyma is only occasionally represented in an expanded connectivum, or slight membranous expansions of the filament. The carpellary leaves have, again, a more or less developed cellular parenchyma, as well as a strong vascular system, the glands becoming sometimes prominent, glanduliform stigmata, or sometimes papillose stigmatic surfaces of extreme tenuity.

Such being the close morphological analogy between the stamen and the stem-leaf, we would next observe that multiplication takes place in the latter almost universally *in one plane* (either horizontal, or, from various causes, more or less vertical), by the ramification or the separation from the base of its ribs, each branch being more or less connected with the remainder of the leaf, or assuming the form of a distinct leaflet. Wherever a *tuft* of leaves occupies on the stem the place of an ordinary leaf, it is not by ramification of the leaf, but by the partial development of the axillary bud of which the axis is not elongated.

Proceeding now, upon these grounds, to compare the modifications of the stamens to those of the stem-leaves, taking the ordinary stamen to represent a petiole (the filament) with a gland on each side of its apex (the two cells of the anther), we see these glands sometimes united into one (the one-celled anther by confluence), or reduced to one by abortion (the dimidiate anther), or sometimes really single and terminal, or increased to four or more in pairs, or two or more superposed or irregularly arranged as in the stem-leaf glands, so in the

staminal anthers.* A split stamen, bearing one cell of the anther on each branch, may be compared to a bilobed leaf; the double stamen of *Cruciferæ*, each bearing a two-celled anther, to a bifoliolate sessile leaf; the treble stamina of *Fumariaceæ* to ternately digitate leaves; and all other cases of what is termed *collateral deduplication* may thus be referred to the ordinary ramifications of leaves, without the necessity of the creation of a new term to explain them.

The so-called *transverse deduplication* is evidently a very different process, and, if really such as it is supposed to be, alone deserves the name of *deduplication*; but, being totally at a loss to find anything analogous in the ordinary stem-leaves, we have endeavoured to explain it by other more normal processes.

There is no doubt that in the case of many polyandrous flowers, such as *Hypericum*, several *Tiliaceæ*, and probably a considerable number of *Mimoseæ* and *Swartzieæ*, a number of stamens occupy the place of one, and that in *Malvaceæ*, as so clearly explained in the work before us, the stamens and petals together occupy that of the petals only; but might not this be better explained by the Heath-like development of a fascicle of leaves in the axillæ of the petals in *Malvaceæ*, and in those of the staminal leaves in other cases, the subtending leaves being represented by the sterile stamens in *Luhea*, and by the large outer stamens in *Mollia* and *Swartzia*?

A greater difficulty may occur in the case of *Rhamneæ* and *Byttneriaceæ*, where Dr. Gray is undoubtedly right in considering the stamens as belonging to the corolline verticil; but in this case it appears to us quite as conformable to the ordinary course to consider the stamen as an axillary production, as to resort to a theory which has no analogy in stem-leaves.

With regard to the inner appendages of the petals of *Ranunculaceæ*, *Caryophylleæ*, *Sapindaceæ*, and so many *Gamopetalæ*, upon which the theory of deduplication has been chiefly based, it appears to us that they are in most cases, if not always, deformed glands; their gradual passage into anthers in some flowers, their position on the principal veins of the petals, and, in some cases, their real glandular nature, tending to confirm the supposition.

* The correspondence of the anthers to the glands of leaves would receive still further confirmation, if it be true that in *Cœlebogyne* fertilization is effected by a viscid fluid exuded from the glands of the bracteæ.

Submitting the above views to the consideration of the enlightened author of the 'Illustrated Genera of the United States Flora,' we now take leave of this inestimable work, trusting that we shall soon have to congratulate the botanical world on the appearance of the third volume, which we understand will mainly consist of the important family of *Leguminosæ*.

Extracts from the private Letters of Dr. J. D. Hooker, *written during a Botanical Mission to* India.

(*Continued from p.* 336.)

Calcutta to Darjeeling in Sikkim-Himalaya.

Not only are the roadsides rich in plants, but Lepcha paths, cutting off all the zigzags, run in straight lines right up the steepest hill-faces, and thus double the available means for botanizing. I need not say it is all but impossible to leave the paths of one kind or other, except for a yard or two up the rocky ravines: the hill-sides are so very steep and densely clothed with forest. Elephants, tigers, and rarely the rhinoceros, inhabit the foot of these hills, with wild boars, leopards, &c.; but none are numerous. The elephant's path is an excellent specimen of engineering—the opposite of the Lepcha track, for it winds judiciously.

At about 1,000 feet above Punkabarrie, the vegetation is extraordinarily rich, and appears all the more so from the many turnings of the road, affording glorious prospects of the foreshortened tropical forests. *Shorea* (Sal), *Gordonia Wallichii* bursting into blossom, and *Cedrela*, with *Careya*, and some others, are still the prevalent gigantic timber-trees, scaled by climbing *Leguminosæ*, as *Bauhinias* and *Robinias*, which sometimes sheath the trunks, or span the forest with huge cables, joining tree to tree. Their trunks are also clothed with parasitical *Orchideæ*, and still more beautifully with *Pothos* (*Scindapsus*), *Peppers*, *Gnetum*, *Vitis*, *Convolvulus*, and *Bignoniæ*. The beauty of the drapery of *Pothos*-leaves is pre-eminent, whether for the graceful folds the foliage assumes, or the liveliness of its colour. Of the more conspicuous smaller trees, the wild *Banana* is the most abundant, its crown of pale yellow and very beautiful foliage contrasting with the darker-leaved plants amongst which it nestles; next comes a

Pandanus? with a straight stem and a tuft of leaves, each eight or ten feet long, waving on all sides (I have seen no flower or fruit). *Araliaceæ*, with smooth or armed slender trunks, and *Mappa*-like *Euphorbiaceæ*, spread their long petioles horizontally forth, each terminated with an ample leaf some feet in diameter. Bamboo abounds everywhere: its dense tufts of culms, 100 feet and upwards high, are as thick as a man's thigh at the base. *Grewia*, *Bradleia*, *Aquilaria*, *Mimosa* and *Acacia*, *Garcinia*, shrubby *Compositæ* and *Cinchonaceæ* are very frequent; also *Vitis*, *Cissus* and *Leea* (I think several species), *Hiræa*, *Gordonia*, *Eurya*, *Triumfetta*, *Hibiscus*, *Abutilon*, *Sida*, *Capparis*, *Kydia*, *Helicteres*, *Hovenia*, *Paliurus*, *Zizyphus*, *Colubrina*, *Casearia*, *Crotalaria*, *Tephrosia*, *Guilandina*, *Uraria*, *Desmodia*, *Flemingia*, *Mucuna*, *Dalbergia*, *Cassia* and *Bauhinia*, *Grislea*, *Lagerstrœmia*, *Sizygium*, *Momordica*, *Bryonia*, *Panax*, *Aralia*, *Hedera?* *Loranthus*, *Nauclea*, *Hymenodyction*, *Mussænda*, *Randia*, *Wendlandia*, *Oldenlandia*, *Ophiorhiza* and others, *Heidyotis*, *Hamiltonia*, *Pavetta*, *Coffea*, *Psychotria*, *Spermacoce*, *Rubia*, *Vernonia*, *Ageratum*, *Eupatorium*, *Conyza*, *Blumea*, *Diospyros*, *Rivea*, *Argyreia* and *Convolvulus*, *Cordia*, *Tournefortia*, *&c.* Of smaller shrubs, *Acanthaceæ* are far the most numerous, then *Fici*, *Euphorbiaceæ*, *Lauri*, *Mæsua*, *Embelia* and *Bœhmeria*, *Celtis*, and various *Desmodia*, *Hedysara*, and other *Leguminosæ*. At this season *Monocotyledones* are scarce: a few *Calami* and other palms, large grasses, and more *Cyperaceæ*, *Scitamineæ*, and *Curculigo*, with parasitical *Orchideæ*, are the prevalent tribes. Amongst the herbaceous vegetation *Cucurbitaceæ* are especially numerous, *Acanthaceæ*, some *Labiatæ*, *Balsamineæ*, *Asclepiadeæ*, *Apocyneæ*, and *Urticeæ*. Along the cut roadside I gathered two *Hydrocotyles*, *Piddingtonia* (which is surely not distinct from *Pratia*), *Oxalis*, *Mollugo*, *Polygona*, *Compositæ*, *Impatiens*, *Desmochæton*, *Ageratum*, *Adenostemma*, *Bidens*, *Wedelia*, and other such tropical weeds. Twenty or thirty species of ferns were luxuriant and handsome. Foliaceous lichens and a few mosses appeared at 2,000 feet.

Such is the vegetation of the roads through the tropical forests of the Sub-Himalaya. I add a list of some of the genera I remarked, which I could all the better observe from being short of paper and without the means of collecting largely. At about 4,000 feet the road crossed a saddle, and ran along the narrow crest of a hill, the top of that facing the plains of India, and over which is the way to the interior ranges,

amongst which Darjeeling is placed, still twenty-five miles off. A little below this a great change had taken place in the vegetation,—marked, first, by the appearance of a very English-looking bramble, which, however, by way of proving its foreign origin, bore a yellow fruit, called here the "yellow raspberry:" the berry is very good.

Scattered oaks, of a noble species, with large lamellated cups and magnificent foliage, succeeded; and along the ridge of the mountain to Kursiong (a Dawk bungalow at about 4,000 feet), the change in the flora was complete. I here entered on the early spring flora of the middle region of the Himalaya, which extends upwards to the Alpine (at 10,000). Fancy me now going north, on a long spur or shoulder of a mountain, which rises, still forest-clad, 4,000 feet higher in front; on either side is a deep, broad valley, running up from the plains: I have left behind me all that is tropical and Indian, and am amongst those temperate natural orders, many of which prevail from hence to the arctic circle, their continuity interrupted only by the deep, narrow gullies which worm their way and carry their tropical vegetation almost up to the snow, or by that chain of peaks still further on, whose height is above that to which vegetable life ascends.

The spring of this region and elevation most vividly recalled that of England. The *Oak* flowering, the *Birch* leafing, the *Violet*, *Chrysosplenium*, *Stellaria* and *Arum*, *Vaccinium*, wild strawberry, maple, *Mimulus*? *Geranium*, *Bramble*. A colder wind blew here: mosses and *Lichens* carpeted the banks and roadsides: the birds and insects were very different from those below; and everything proclaimed the marked change in elevation, and not only in this, but in season, for I had left the winter of the tropics and here encountered the spring of the temperate zone.

So many tropical genera ascend thus high, and 2,000 feet more, that I think the change caused by the relative difference in the season was more marked than that due to elevation; but when the line drawn by both is clear, it becomes hard to judge. Thus, the spring flowers I mentioned are so notoriously the harbingers of a European spring, that their presence carries you home at once; but, as species, they differ from their European prototypes, and are accompanied at this elevation (and for 2,000 feet up) with *Pothos*, *Bananas*, *Palms*, *Figs*, *Pepper*, numbers of epiphytal *Orchideæ*, and such genuine tropical genera. The uniform temperature and humidity of the region here favour the growth of

the tropical plants in a temperate region; exactly as the same conditions cause similar forms to reach higher latitudes in the southern hemisphere (as in New Zealand, Tasmania, South Chili, &c.) than they do in the northern.

Along this ridge I met with the first Tree-fern. This most beautiful object delighted me, whether because it was an old friend, or from its extreme beauty and grace; the latter, I expect; for I had already seen so many tree-ferns, and in so many parts of the globe, the Atlantic Islands and shores, the Cape, America, Australia, and New Zealand, that if any one's appetite for so attractive an object could be palled, it should be mine. This species, as all others known to me, is far inferior to the Tasmanian in appearance; it seldom reaches that height (of forty or fifty feet),—the trunk is but three or four, instead of twelve or fourteen, in girth, of a dark blackish, instead of a rich ochreous brown tint, and the feathery coma is ragged in comparison. I presume it to be nearly allied to *Alsophila gigantea* (Wall.): it never occurs much below 4,000 feet that I have seen, and ascends to nearly 7,000.

Kursiong bungalow, where I stopped a few hours to eat and put my plants in paper, is superbly placed, on a narrow mountain ridge. From the west window you look down the valley of the Balasun river, from the east that of the Mahanuddy: both rise from the outer range, forming the broad, deep, and steep valleys of rivers which give them their respective names (about 3,500 feet deep), and are richly wooded from the Terai to their tops. Till reaching this spur, I had zigzagged upwards along the western slope of the Mahanuddy valley. The ascent from the spur at Kursiong to the top of the mountain (on the northern face of which Darjeeling is situated), is along the eastern slope of the Balasun.

From Kursiong a very steep zigzag leads up the mountain, through a magnificent forest of chestnut, wallnut, oaks, and *Lauri*. It is difficult to conceive a grander mass of vegetation:—the straight shafts of the timber-trees shooting aloft, some naked and clean, with grey, pale, or brown barks; others literally clothed for yards with a continuous garment of *epiphytes*, green, and of all kinds of foliage, or one mass of blossoms, especially the white *Cœlogynes*, which bloom in a profuse manner, and literally powder the trunks with snow. More bulky (to appearance) trunks were masses of interlacing climbers, *Araliaceæ*, *Leguminosæ*, *Vitis*, and *Menispermum*, *Hydrangea*, and *Peppers*, enclosing a hollow, once filled by the now strangled supporting tree, which had

long ago decayed away. From the sides and summit of these, supple branches hang forth, either leafy or naked; the latter resembling cables flung from one to other trees, swinging in the breeze, their rocking motion increased by the weight of great bunches of ferns or *Orchidaceæ*, which are perched aloft in the loops. Perpetual moisture nourishes this dripping forest; and pendulous mosses (*Hypna* and *Neckera*) and lichens (*Borrera* and *Usnea*) are first met with, and in inconceivable profusion.

Two thousand feet higher up, near Mahalderam (from whence the last view of the plains is gained), subalpine plants appear,—*Uvularia* or *Disporum*, *Berberis*, *Paris*, &c.; but here, night gathered round, and I had still ten miles to go to the nearest bungalow, that of Pacheem. The road, tolerably level, still led along the eastern slope of the Balasun valley, which was exceedingly steep, and so cut up by ravines, that it winds in and out of gullies, whose salient angles seem almost near enough to jump across. Night was ushered in by an impenetrably thick fog and *Scotch* mist, which made me hurry on apace. It soon, however, cleared off, with a transient thunder-storm, heightening the grandeur of the scene. The fog suddenly rose, and, looking aloft, the moon danced amongst the tree-tops. To the right the forest abruptly ascended; to the left, the black abyss of the valley, seen through the trunks, was really awful; occasionally a bright gleam of lightning shot across the sky, followed by a bellowing peal of thunder; and as the wind drove ragged masses of vapour down the valley, like smoke from a gun, I could not help likening the effect to that of a brave ship firing a salute.

In no part of the world might the phenomena of the formation and dispersion of wreaths of vapour be studied better than here. The excessive humidity of the atmosphere, the various densities of the strata which so deep a valley encloses, the rarefaction and warmth of the air towards its centre, and the coolness of that portion immediately surrounding the trees on either side, expose a cloud to great vicissitudes; hence, clouds are ever forming and evaporating; one great mass is stationary, another tearing and blundering along past it and down the hollow, dissipating as it approaches the heated plains of India, running headlong against the trees of some jutting spur, then quickly condensed again, one part hanging like ragged sheep's-wool to the tree-tops, another carried away to utter dissolution. Other dense masses again

ascend slowly and steadily from the bottom of the great valley, expanding majestically, filling many miles with mist, and still rising till they overtop the hills, and again are contracted into white clouds, resuming after this apotheosis their natural shape in their original place. You can have no idea of the apparent solidity and definition of the clouds in these vast valleys, nor could you readily believe with what precision one can foretell the fate of each mass. I have often sat and watched them from Darjeeling as they float through this middle region of the atmosphere, and know many a hill and gully which are the Scylla and Charybdis of these restless bodies. Like ships on the sea, they obey laws common to both the aqueous and aërial ocean, and it is natural to suppose they should; but one does not often see such conspicuous proofs of it.

So lately as I had left the busy plains of India, the solitude of these gloomy forests could not but arrest the attention. Below, it is difficult to get out of reach of the noise of the Hindoo, his tomtoms, and the sight of his fires as he makes poojah by night to his gods;—here the profound stillness of night is broken only by three sounds:—1. the roar of innumerable cataracts, swelling on the ear and again hushing as you pass in and out of gullies, still always, from their numbers, keeping up that peculiar, hollow, æolian roar, whose tone is the same with that of the sea-surf, or the heavy gale in the forest, and which we never hear imitated,—it is an accompaniment, confined, I believe, to the motion of the elements, moving on a grand scale; 2. by the harsh cough of the little barking deer; and 3. by the melancholy double hoot of a nocturnal bird. Nothing can be more doleful than the cry of this latter winged creature; it reminded me of the voice of the penguin, far at sea in the stormy Antarctic Ocean; it wakes the night when least expected, and where its voice tells best on the already excited feelings.

It was very late before I arrived at Pacheem bungalow, the most sinister-looking rest-house I ever saw, stuck on a little cleared spur of the hill, surrounded by dark forests, and enveloped in mists and rain, hideous in architecture, being a miserable attempt to unite the Swiss cottage with the suburban gothic;—it combined a maximum of discomfort with a minimum of good looks or good cheer. I was some time in finding the dirty house-keeper, in an outhouse hard by, and then in waking him. As he led me up the crazy verandah, and into a broad ghostly room, without glass in the windows, or fire,

or any one comfort, I felt strangely alive to the truth of my childhood's story-books, about the horrors of the Hartz forest, and of the benighted traveller's situation therein. Cold sluggish beetles hung to the damp walls,—and these I ruthlessly bottled. After due exertions and perseverance with the damp wood, a fire smoked lustily, and, by cajoling the gnome of a house-keeper, I procured the usual roast fowl and potatos, with the accustomed sauce of a strong smoky and singed flavour.

Pacheem stands at an elevation of some 8,000 feet, and as I walked out on the following morning I met subalpine plants in abundance, but was too early in the season to get aught but the foliage of the generality: *Piddingtonia*, *Chrysosplenium*, *Viola* (of a different species from that at Kursiong), *Lobelia*, a small *Geranium*, *Fragaria*, little *Polygona*, five or six *Rubi*, *Arum*, *Paris*, a delicate little *Isopyrum*, *Convallaria*, *Uvularia*, *Disporum*, *Carex*, creeping *Urticeæ*, and succulent great ones too, *Arenaria* (or *Stellaria*), *Ainsliea*, *Rubia*, *Vaccinium*, and various *Gnaphalia*. Of small bushes, *Corneæ*, *Caprifoliaceæ*, and *Araliaceæ* predominated, with *Symplocos* and *Limonia*, *Eurya*, bushy *Rubi*, having simple or compound green or beautifully silky foliage, *Hypericum*, *Hydrangea*, *Berberis*, *Lonicera*, *Artemisia*, *Urtica*, *Adamia cyanea*, *Viburnum*, *Sambucus*, dwarf Bamboo, &c.

The climbing plants were still *Panax* or *Aralia*, *Kadsura*, *Sauraujà*, *Hydrangea*, *Vitis*, *Smilax*, *Ampelopsis*, *Polygona*, and, most beautiful of all, *Stauntonia*, with pendulous racemes of lilac blossoms. *Epiphytes* were rarer, still I found *Cœlogyne*, and several other genera of *Orchideæ*, *Vaccinia*, and a most noble white *Rhododendron*, whose truly enormous and delicious lemon-scented blossoms strewed the ground. The trees were one-half oaks, one-quarter *Magnoliæ*, nearly another quarter *Lauri*, with a scattering of birch, alder, maple, holly, *Pruni*, *Pyri*, *Cerasus*, *Styrax*, *Symplocos*, and *Limonia*. Neither *Juglans*, tree-ferns, nor *Castanea* ascend so high; nor, of course, palms or bananas, *Pothos* or peppers. The rarity of *Leguminosæ*, I might say their *total* absence, was most remarkable, and must be a prominent feature in the vegetation of this region: it is too high for the tropical tribes of the warmer elevations, too low and too moist for the *Galegeæ* and *Astragaleæ*; still why are there no *Viceæ*, nor the pretty *Parochætus* I had left only 1,000 feet below? Except *Isopyrum*, *Ranunculaceæ* were totally absent; there may be a few species of *Clematis*, but I did not observe them, and they cannot be many; certainly no *Ranunculus*, that ubiquitous genus

which does not even desert the plains, whose climate is otherwise so unsuited to the whole natural order. *Cruciferæ*, too, were absent, and more remarkable still, Grasses, of which I found but one native species. Both *Poa annua* and *Trifolium* (white Dutch clover) flourished where accidentally disseminated, but only in artificially cleared spots (as do *Spergula*, the potato, and *Viola tricolor*, about Darjeeling).

Polytrichum is the prevailing terrestrial Moss here, with *Bryum*, *Funaria*, and *Bartramia*, all genera complex in organization. On the trees the *Hypna* and *Neckeræ* were flung in profusion, with pendulous stems a foot or even three feet long. I saw no *Sphagnum*. *Jungermanniæ* presented nothing remarkable; they are in moderate abundance, the much vexed (by botanists) genus *Plagiochila* predominating. Lichens are in admirable profusion, rather the corticolous, however, than the terrestrial species. *Cenomyce*, *Cladonia*, *Stereocaulon*, and *Sphærophoron*, though present (and where are they not?), were rare; nor are there arboreous species of all groups. *Peltidea* and *Sticta* grew sparingly on roots and stumps; *Borrera*, *Usnea*, and *Parmelia*, on the twigs and branches abundantly. The appressed foliaceous genera, as *Lecanora*, *Psora*, and *Placodium*, are scarce; and much more so the crustaceous, the *Opegraphæ*, *Graphis*, *Glyphis*, *Lecidea*, *Pertusaria*, *Arthronia*, *Urceolaria*, *Chiodictyon*, &c., which so swarm on the trunks of the hot tropical forests, and which I had seen in Ceylon absolutely whitewashing the barks.

Ferns I should have mentioned before. I have about sixty species from this region, chiefly of temperate genera, except *Davallia*, which rather abounds, and the noble *Sphæropteris*:—*Cyatheaceæ*, *Alsophilæ*, *Lygodia*, *Acrostichum*, *Gleichenia*, the bird's-nest-like *Asplenia*, Quercifrond *Polypodiaceæ*, and *Adianta* affect a lower level. Here *Asplenia*, *Aspidia*, *Pteris*, *Hymenophyllum*, *Polypodium*, *Lomaria*, and *Davallia*, are the most abundant; there is a *Marattia* besides; *Lycopodia* are far from copious; there appear more *Selaginellæ* than *Lycopodia* proper.

The Cryptogamic vegetation, though most luxuriant in individuals and in the development of some species, is as inferior to that of the South temperate and Antarctic regions as well can be. In New Zealand I could gather double the number of noble Ferns in an hour, that I could here in a day; there, or in Fuegia, as superior a number of Mosses; and in Fuegia or Tasmania, an equally greater amount of far more splendid Lichens. The supremacy of this temperate region consists in the infinite

number of forest-trees and dicotyledonous plants, in the absence (in the usual proportion, at any rate) of such plebeian Orders among them as *Compositæ*, *Leguminosæ*, *Cruciferæ*, and *Ranunculaceæ*, and of *Gramineæ* amongst monocotyledons; and above all in the predominance of the rarer and more local families, *Magnoliæ*, arborescent *Ericeæ*, *Araliaceæ*, *Corneæ*, *Caprifoliaceæ*, *Saxifrageæ*, and *Ternstrœmiaceæ*.

These observations are, however, premature, considering how little I have seen, and at how unfavourable a season.

From Pacheem, the road runs in a northerly direction to Darjeeling, still along the Balasun valley, till the saddle of the great mountain Sinchal is crossed. This is narrow, stretching east and west, and from it a spur projects northwards, advancing some miles amongst the cluster of Sub-Himalayan hills still intervening between it and the snowy ridge. This saddle crossed, you are fairly amongst the mountains: the plains behind are cut off by it; in front, the snows may be seen when the weather is propitious. The valleys on this side of the mountain run north, and pour their waters into great streams which, coming from the snow, wind amongst the hills, and débouche into the Teesta, to the east, where it divides Sikkim from Bhootan. Darjeeling station occupies a spur, or narrow ridge, of Sinchal mountain, which projects north some five or six miles, and then bifurcates, the horns descending steeply to the bed of the Rungeet river, up whose course the eye is carried almost to the base of the great snowy range. Darjeeling spur is very narrow at the top, along which the houses are perched, as they are on its flanks, where narrow *locations* on the east, and broader ones on the west, are cleared from wood. On either side the valleys are profound, at least 5,000 feet, and the slope to them is one clean forest-clad sweep, with no step, flat, or horizontal plane, and no absolute precipice: it is a sheer slope, especially to the east; from the west flank innumerable little spurs project, occupied by Lepcha and Limbo clearings.

Two roads run round the station, meeting at the north extreme. I continued along that of the east flank, which overhangs the valley of the Rungmo river. Looking east, the sweep of hills from the ridge I had crossed is very fine: they form a vast amphitheatre some four miles across and 4,000 feet deep, clothed throughout with an impenetrable dark forest. There is not one clear patch except near the very bottom, where are some scattered hamlets of two or three huts each. The rock is everywhere near the surface, and the road has been formed

by blasting at very many places. In its present state, it is much like that through the Trosachs: a rocky bank rises abruptly to the top of the ridge, and a wooded slope descends as suddenly from its edge. Having descended from the ridge I came here upon the upper limit of the chestnut, a tree second in abundance to the oak, gigantic, tall, and straight in the trunk. The rising bank is alternately mossy, rocky, and clayey, and presents a good geological section, all the way along, of the nucleus of Darjeeling spur. Numerous rills cross the road, and are margined with herbs, especially *Mimulus*, *Chrysosplenium*, and *Torenia*, *Hydrocotyle Nepalensis*, &c.;—no grasses. You have only to plant the Trosachs, or the rocky country about Killin, with the herbs which I enumerated at Pacheem, to represent the scene to the eye: the cryptogamic vegetation of either will answer to both, if you do not take the microscope. Raise your eye from the road to the tall trees on either hand, or to the mountains beyond, and the scene is widely different; this is far less varied, less picturesque in colour or outline, less stern in proportion to the relative dimensions of the masses, but incomparably more grand,—inexpressibly more so to a stranger.

(*To be continued.*)

BOTANICAL INFORMATION.

Professor Parlatore.

[The accompanying extract of a letter from Professor Parlatore to P. B. Webb, Esq., will be read with interest. We have elsewhere noticed that this able botanist is engaged on a 'Flora Italica.'—Ed.]

Turin, September, 1849.

"I cannot help hoping that you will return to Florence, and pass the winter there, and continue the 'Ethiopico-Egyptian Flora.' It is not yet published, but is, for the most part, composed; and I hope it will make its appearance during the month of October. Come, then, and aid me to describe the other families, and gratify with your presence myself and our good friend Bubani, whom I left in Florence when I set off upon my late expedition into Switzerland. My health

has been much improved by travelling among the Alps, though I suffered great fatigue, and incurred no slight perils. Among the latter, I must particularize a tremendous hurricane, which overtook me when I was descending the southern or Italian side of Mont Blanc, precisely at the part called the *Col du Géant*. I was surrounded with snow and glaciers, while wind, rain, and sleet poured with fearful violence and stunning noise upon my unlucky head. Worse still were the dazzling lightning and unceasing crashing thunder! I was drenched, and thoroughly chilled; and it was, perhaps, fortunate for me that six hours' hard walking was necessary to bring me to any shelter. The nearest point was Courmayeur, where I remained two days to recover myself.

"I have diligently explored the chain of Mont Blanc, and climbed all the summits as high as to the entire cessation of vegetation. All the principal glaciers I have visited, and on Mont Anvert and the Mer de Glace I passed more than six hours. Geneva, Chamounix, Martigny, Aosta, and the Grand St. Bernard, have occupied my attention; and I have spent twenty-two days, and at the rate of 80 francs per day for guides, &c., while climbing the mountains. I am, however, well satisfied with the results of my expedition, as concerns my Italian Flora, and especially the subject of Botanical Geography, which was the principal scope of the undertaking; for I have succeeded in ascertaining the limits of many plants, by means of proper instruments, which I carried for the purpose of making observations. I had the pleasure of passing a day with De Candolle at Geneva, where I also saw Duby and Choisy. Poor Boissier has lost his wife, who died at Granada of typhus fever: he is now residing at the small village of Svizzara, some distance from Geneva, and he receives no person.

"Here, at Turin, I have met with Morio. It is my intention to remain a fortnight in this city; and, besides the week already so spent, I shall devote that time to investigating the Herbaria of Balbis, Bellardi, &c., with an eye to my Italian flora. At Pisa I examined the Herbarium of Savi. Requien is still in Corsica.

"FILIPPO PARLATORE."

Indian Utriculariæ.

The following *Conspectus of Indian Utriculariæ*, by Dr. Wight, has been obligingly communicated to us by the author.

Floating. (Calyx-lobes herbaceous, not covering the capsule.)	
Calyx equalling the capsule, at length diverging. Seed peltate, wingless.	
Scapes with a whorl of floats below the flower	*U. stellaris.*
Scapes without floats	*U. fasciculata.*
Calyx shorter than the capsule appressed, seed flat, bound with a wing.	
Scapes 3–5 or more flowered, seed-wing dentate. (The flowers of this species appear blue, all the others of this group have them yellow.) Mergui .	*U. punctata.*
Scapes two-flowered, seed-wing entire . .	*U. diantha.*
Terrestrial. (Calyx-lobes enlarging, becoming, in fruit, sub-scariose, converging and covering the capsule.)	
Calyx-lobes ovate, sub-acute; scales and bracts attached by the base.	
Seeds finely reticulate, ovate, oblong.	
Flowers some shade of blue (not yellow).	
Calyx acute, seed elliptical, obtuse at ends.	
Spur shorter than the lower lip, descending	*U. reticulata.*
Spur equalling or exceeding the lip, arcuate, horizontal . . .	*U. arcuata.*
Calyx blunt, sub-orbicular in fruit, seed ovate, pointed at one end . .	*U. humilis.*
Flowers yellow (seed oblong, elliptical) .	*U. Wallichii.*
Seed finely reticulated, globose.	
Spur as long or longer than the lower lip.	
Cæspitose, leaves spathulate, scapes lax	*U. conferta.*
Distinct, sub-aphyllous, scape sub-voluble	*U. uliginoides.*
Spur shorter than the lip, scape straight, erect	*U. uliginosa.*

Seed scrobiculate, flowers blue.
  Scales on the scape few, appressed.
    Pedicels longer than the flower.
      Spur about the length of the lip.
        Upper lip of the corolla sub-orbicular.
          Seed simply scrobiculate (flowers as large and like those of *U. reticulata*) . . . . *U. Smithiana.*
        Upper lip linear, truncated, seed foveolate (flowers much smaller than those of the preceding: apparently aquatic, growing in shallow water) . . . . *U. Griffithii.*
      Spur much shorter than the lip, pedicels long . . . . *U. pedicellata.*
    Pedicels shorter than the flower.
      Flowers subsessile or very short-pedicelled; upper lip of the corolla emarginate . . . . *U. brachypoda.*
      Flowers distinctly pedicelled, upper lip of the corolla entire . . *U. affinis.*
  Scales of the scape numerous, sub-cernuous (not appressed) . . . *U. squamosa.*
Seed papillosely hispid, flowers yellow (scales on the scape sub-foliaceous) . *U. macrolepis.*
Calyx-lobes obovate or sub-orbicular, bracts and scales attached by the middle or above the base.
  Seed glochidiate, scales attached a little below the middle, lower lobe obtuse: (seed ovate oblong, acute at one end: lobes of the calyx very unequal: spur conical: upper lip emarginate, under sub-orbicular, spreading, 5-toothed: leaves orbiculato-spathulate, scape flexuose) *U. glochidiata.*
  Seed reticulated, not glochidiate, scales attached by the middle, acute at both ends.

Flowers sub-sessile.
  Spur longer than the lower lip.
    Flowers somewhat remote, sub-racemose . . . *U. nivea.*
    Flowers congested, spicate on the apex of the scape (the flowers of both these are nigrescent in drying, but do not appear to differ in colour, hence I suspect an error in the name *cærulea*) . . . *U. cærulea.**
  Spur shorter or about the length of the lip (lip large, revolute on the margin, covering and nearly concealing the spur) . . . . . *U. racemosa.*
Flowers longish, pedicelled, seed scrobiculate *U. bifida.*

Swan River Botany.

[It is long since we have given any account of Mr. James Drummond's excursions in Western Australia. We shall here, and in our future numbers, give occasional extracts from his many letters now before us, written during the year 1844, and since, from the Swan River Colony.—Ed.]

Hawthornden Farm, Swan River, Feb. 21st, 1844.

I have just returned, after a three months' expedition, in which I have examined part of the country about the Beaufort and Gordon rivers, and the district south and east of King George's Sound, as far as the Prorongarup range of hills and Mount Mary peak. On my return, I received your letter by the Ganges; and I beg to offer my best thanks for your remarks upon my collections of dried plants. I am sensible that they are not so well preserved as I could wish; but the fact is, that I had been a cultivator for many years ere I gave any attention to the process of preparing specimens for an Herbarium; and, had it not been for the encouragement you obligingly held out, I should never have made the attempt. Now that I have brought myself to live in the Bush as comfortably as in a house, it would be a pity to relinquish

* *U. cærulea* and *filicaulis* appear to be varieties only of the same species (the former young, with the first flowers only open, the latter old, with the short spike elongated into a fructiferous raceme). My specimens show, I think, the transition.

making expeditions and collecting specimens through a want of funds; yet I sometimes fear this must be the case. Let me travel in what direction I will, I cannot expect to add more than 200 or 300 species to my store; and the sale of seven or eight sets of them does not defray half the necessary cost of collecting. However well the natives of this country are naturally disposed to behave when unmolested, it is impossible to venture upon travelling among strange tribes without at least three persons, well armed, being of the party, with the necessary provisions, pack-horses, &c.; and this costs a great deal of money. This year I have amassed a valuable collection of seeds—*Banksia* and *Dryandras* alone amounting to between forty and fifty species. My son, a servant, and I, have lived entirely in the bush among these things for the last three months; and if I cannot dispose of my collections among British nurserymen, I hope to sell them to advantage in Paris.

To-morrow I start for Freemantle, where *Cephalotus follicularis* grows, that I may ship two or three boxes of it on board the Shepherd, advertised to sail for London early next week.

During my recent excursions, I gathered many highly interesting plants which were new to me. Mr. Brown describes only one species of *Franklandia*; but we have at least two, and I doubt if either of them be his plant. The species common about King George's Sound, and as far north as the Beaufort river, must have been seen by many botanists, and overlooked for the *F. fucifolia* of Brown, from which it differs in many important points, chiefly the seeds. The flowers, too, are dull yellow, and the plant grows three or four feet high, with glaucous leaves. Another *Franklandia*, from the Capel river, of which I sent you seeds, coincides with *F. fucifolia* in the seeds; but the inflorescence is white, and the whole plant of much humbler growth. I lately found again the beautiful blood-red *Banksia*, which I have described in a former letter: it is allied to *B. verticillata*, having ten to fourteen leaves in a whorl, and is the most beautiful species of this country. It well deserves the name of *floribunda*; for when one set of flowers is fully blown, the cone above it is prepared to bloom in two or three weeks, and a third in succession, still higher on the branch, is considerably advanced. I hope to send abundance of the seeds of this noble *Banksia*, and also of another very fine species, the *B. Brownii* of Baxter, which is verticillate, though not so described by Mr. Brown; its leaves are beautifully pinnate, like those of *B. decurrens*. But it

would occupy too much time and paper were I to attempt enumerating all the individuals of the genus *Banksia* which I found during my last excursion. One only I must particularize: it had very large flowers varying in colour from pale pink to rose, and setaceous, glaucous leaves.

I am delighted to hear that the Royal Gardens are prospering, and that some of our Swan-river productions are thriving at Kew. While I lived in England, I used often to remark that Australian plants seldom looked well after the second or third year; and since I have resided among them, the reason has occurred to me, which is, that they ought to be cut down close to the ground when they begin to get ragged; and that the pruning-knife and a mixture of wood-ashes in the soil would probably prove an effectual substitute for the triennial burnings to which they are subjected at home. Some of our shrubs never bloom in perfection till the season after the ground is burnt over. Among these is the *Nuytsia floribunda*, which looks like a blackened leafless trunk after a good bush-fire, but is covered the next year with one mass of orange flowers.

During my late journey to the south, I gathered a most exquisite *Stylidium* in flower. For several years I had observed its foliage; but a careful examination of the plant in various situations leads me to the conclusion that the inflorescence is never produced in perfection, except on the second year after the ground has been cleared by fire. The leaves, which shoot up very beautifully, become hard and rigid in the course of two or three years, and seem incapable of supplying the nutriment necessary to enable the plant to form its flowers and to mature its seeds. I have named it *S. elegans*: its roots are thick and fibrous; the leaves 18 inches long, lanceolate, smooth, and silky; the flowers are rose-coloured, and borne on stalks from a foot and a half to two feet high: on the whole, I consider it the finest species of the genus.

I am sorry to say, none of the hills in this colony are of sufficient height to produce alpine plants. While we were encamped at the foot of the Prorongarup range, I often observed the mist resting on their summits; but the sole indication of increased moisture that I could find consisted in the size of the foliage of a fine yellow-flowered *Villarsia*, of which I saw some measuring a foot across, being the largest leaf I ever beheld in Australia. I gathered specimens of it on the Christmas day of 1843, among the crevices of that pile of granite rocks on the summit of the hills, to which the name of Stirling Castle

is familiarly given by us settlers. Two ferns grew with the *Villarsia*, both apparently species of *Asplenium*. In one I seemed to recognize an old acquaintance, cultivated in England: it has beautifully cut leaves. The other closely resembles *A. filiforme* of Gardner, in your *Icones Plantarum* (Tab. LIII.), and it strikes root in a similar way at the point of the fronds.

I have been again disappointed in the nature of the soil on these hills. Though barren as botanists' hearts could wish, all the way from King George's Sound to the foot of them, no sooner had we begun the ascent than we found the ironstone formation, which is very rich in plants, to disappear; and a variety of granite took its place, accompanied by a perfect change of vegetation. The granite formation is covered with immense trees of the *Eucalyptus* I have previously mentioned, many of them one hundred feet high without a branch; also very large trees of the common red gum. We found plenty of water on the Prorongarups, in a beautiful valley: it was a clear running stream, its banks adorned with the *Boronia Molloyi*, which I described before, and many other plants, identical with what I had seen between the Vasse and Augusta. Indeed, a large proportion of the vegetation is the same:—a proof that it is often more dependent on soil than climate. The *Boronia* which I gathered at King George's Sound proves distinct from *B. Molloyi*. A gentleman named Neil, who is stationed in that district, and who is kindly desirous of aiding naturalists in their researches, pointed out to me a remarkably fine *Acacia*, allied to *A. decurrens*, and which, if it proves new, I wish should be called *A. Neilii*. I shall send home specimens of it, and plenty of seeds: you will observe that it has doubly-pinnate foliage.

As I have reason to apprehend that some of my plants from the the Swan River are the same as Mr. Preiss's, and therefore not so acceptable to my kind purchasers at home, as those from an untravelled district would be, I mean to avoid, in future, going over the same ground as that naturalist.

The natives tell me of a *Banksia* with blood-red flowers, which grows in the interior, towards the north-east, and compared with which the *B. grandis* is but a pigmy! I shall do my best to discover it, and to ascertain the truth of this report.

JAMES DRUMMOND.

Professor Endlicher.

[A recent number of the 'Allgemeine Zeitung' gives the following particulars relative to the lamented Stephen Endlicher, whose death, as is well known, took place in April last, at Vienna.—Ed.]

"There is a very prevalent report, which may, perhaps, also reach your ears: it is said that Professor Endlicher has poisoned himself. There is not one word of truth in this rumour. He predicted, firmly, three years ago, at the death-bed of his friend Professor Lippich, that he would sink under the same malady. But the source of this report is a very deplorable one. Endlicher lived in very embarrassed circumstances;—I mean not for a moment to assert that he is a sacrifice to our former educational system! According to this system, scientific efforts were valued, only, according to the numerical amount of lecture hours; and, since it was only during summer that Endlicher gave lectures as professor of botany, his salary was but 1,500fl.; if free quarters and all other things be added to it, the total amount would be 3,000fl. A man like Endlicher, of European celebrity, whose name was one of the greatest ornaments to the University, was valued at the rate of 3,000fl.,—a sum which a professor in Germany would derive from fees alone! But he was so much animated by that honourable zeal and activity which leads to distinction in this world, that he involved himself in debt for the sake of science. He collected an Herbarium, and presented it to the Imperial Museum: he had made a fount of Chinese types, and presented it to the national printing establishment: he published expensive works at his own cost, and presented them to the literary world. As inheritor to the post which the Jacquins had occupied, he purchased their excellent botanical library, to secure it to Austria. Nay, in order that the only point of union for men of talent, natives as well as foreigners, which the wealthy Vienna has to boast of, might not be interrupted, he kept up Jacquin's evening *soirées* at his own cost — at the cost of a poor professor! To support all these objects Endlicher had no more than the bare 1,500fl.; and yet people lift their hands with astonishment at the spectacle of a titled professor dying in debt, instead of folding them in sorrow over that state of things which left a professor no alternative in Austria, provided he intended to shine in his science. Let us, however, indulge the hope that a system which scarcely spends as much for the maintenance of all the nine

universities in the empire as the value of half the steam-vessels on the Danube, may sink with this last sacrifice to it; that it may be buried in the grave of our poor Endlicher, the harvest of whose labours consisted exclusively of honorary diplomas and dedications!"

Description of a new MELASTOMACEOUS PLANT, *discovered in Jamaica, by* DR. MAC FADYEN.—(W. J. H.)

TAB. XII.

While preparing materials for the second volume of the 'Flora of Jamaica,' Dr. Mac Fadyen's attention was directed to a new Melastomaceous plant, which he has kindly forwarded to us, and which we are desirous of dedicating to him under the name of

TETRAZYGIA FADYENI;

Glaberrima, fruticosa, ramis erecto-patentibus, foliis breviuscule petiolatis ellipticis coriaceis integerrimis trinerviis basi acutis subtus pallidis punctato-glandulosis, cymis terminalibus multifloris, calyce turbinato truncato dimidio superiore libero, petalis quatuor erectis obovato-spathulatis (purpureis), staminibus octo, capsulis bilocularibus, seminibus cuneatis.

HAB. Parish of St. Anne's, Jamaica; *Dr. Mac Fadyen. Mr. Purdie.*

A further description of this handsome plant may be looked for in the 'Jamaica Flora,' made from recent specimens, by Dr. Mac Fadyen. The plant will be found to accord in all essential particulars with the genus *Tetrazygia.* As a species, it is abundantly distinct from any hitherto described, in the elliptical obtuse leaves, the 2- (not 4 or 5-) celled capsule, the erect, comparatively large petals (in this particular looking like a *Charianthus*), and in the much exserted erect stamens.

TAB. XII. Fig. 1. Portion of the under side of a leaf. 2. Flower. 3. Anther. 4. Vertical section of the calyx and ovary. 5. Transverse section of ovary. 6. Capsule. 7. Immature seed. All but fig. 6 more or less *magnified.*

Blooming Agave.

There has been in bloom at the Apothecaries' Garden, Chelsea, an interesting species of Agave, which appears to be the *A. Mexicana* of Haworth. The general aspect of this plant before it gave evidence of flowering was not dissimilar to that of *A. Americana*; but in its flowering state it proves quite different from that species, especially in the arrangement of its inflorescence, which, instead of forming a pyramidal head, with horizontal branches, has the branches ascending and forming a dense head, which becomes thicker and broader upwards. There seems little doubt that this plant has been reared, and probably from its very infancy, in this garden; and it is therefore to be regretted that no record of its origin, nor any historical particulars respecting it, appear to have been preserved. Under these circumstances, it is impossible to form even a conjecture as to the age of the plant. But considering that it has naturally a somewhat less massive appearance than the common Agave, it would appear to be a full-sized specimen, the spread of its leaves being about seven feet, their height four feet, and the height of the flowering stem, measuring from the base of the plant, nineteen feet six inches. This stem has twenty-four branches, and these are again subdivided into eight secondary branches, terminated each by a cluster of flowers; the numbers of flowers may be estimated at about 4,000; thus, $21 \times 8 \times 24 = 4032$.—*Gardeners' Chronicle.*

NOTICES OF BOOKS.

THE NIGER FLORA; *or, an Enumeration of the Plants of* WESTERN TROPICAL AFRICA, *collected by the late* DR. THEODORE VOGEL, *and including* 'Spicilegia Gorgonea,' *by* P. B. WEBB, ESQ., *and* 'Flora Nigritiana,' *by* DR. J. D. HOOKER *and* GEORGE BENTHAM, ESQ.; *with a sketch of the life of Dr. Vogel, edited by* SIR W. J. HOOKER; *with two views, a map, and fifty botanical plates.* One vol. 8vo. Baillière, 1849.

The plants here described are mainly from the collection made by Dr. Vogel, while attached as botanist to the expedition sent by Her Britannic Majesty to the River Niger, in 1841, under the command of Captain H. D. Trotter, R.N., &c., &c., to whom the work

is dedicated. It commences with a preface by the Editor, giving a brief account of the origin of the expedition, and of the valued assistance the Editor received from some of the most distinguished botanists of the day in the descriptive part of the work; which is followed by "Desiderata from Botanical Collections in Western Tropical Africa," by Mr. Bentham. The *Memoir of the Life of Dr. J. R. T. Vogel*, translated from the German of Dr. L. C. Treviranus, by the Rev. M. J. Berkeley, occupies twenty-one pages; and the translation of Dr. Vogel's *Journal of the Voyage to the Niger*, by Mr. Scheer, occupies fifty-one closely-printed pages more. The rest of the volume, 515 pages contains the Flora, consisting of—

1. Notes on *Madeira* Plants, chiefly by Dr. J. D. Hooker, with a list of the species.

2. Very brief notice on the Botany of *Teneriffe*.

3. *Spicilegia Gorgonea*; or a list, with descriptions of new species, of all the plants as yet discovered in the Cape de Verd Islands, from the collections of Dr. Hooker, Dr. Vogel, and others, by P. Barker Webb, Esq., &c.

4. *Flora Nigritiana*; or a Catalogue of the Plants (with descriptions of the new genera and species) of the River Niger, the Island of Fernando Po, and adjacent parts of Western Tropical Africa, from the collections of Dr. Vogel, Mr. G. Don, and other travellers; in part by Dr. Hooker, but by far the greater portion by G. Bentham, Esq.

The map is a small one, but well executed, expressly for the work, by Arrowsmith. The landscape scenes are beautifully executed in lithography, and consist of, first, a view of the island of Fernando Po, with its giant mountain, (the most conspicuous white building near the shore represents the house in which Dr. Vogel breathed his last,) and, second (a double plate), showing the luxuriant vegetation of the Delta of the Niger. The remaining fifty plates * are wholly botanical, from the pencil of Mr. Fitch, and exhibit the same number of the more remarkable species of the Flora.

A work treating on the plants of tropical Western Africa has long been a desideratum, and we are sure, as remarked by the Editor, "it will be hailed by every friend of botany, and by every one interested in the vegetable productions of those regions, as a *Prodromus*; some-

* The same plates had already appeared in the 8th volume of the 'Icones Plantarum,' with more full descriptions and remarks by Dr. Hooker, or by M. Planchon.

thing upon which a more perfect structure will be hereafter built." Hitherto, and even still, some of the most useful vegetable products are unknown to us, and Mr. Bentham well observes in his "Desiderata," "the *practical*, *economical*, and *commercial* Botany of West Tropical Africa is less understood, perhaps, than any other branch. Products of the greatest value have been thence exported during a long course of years, without our being able to form the smallest idea of the plants which supply them. Every collector has sent home a different leaf as that of the 'African Teak,' or 'African Oak.' The learned researches of Dr. Pereira have not yet, for want of the requisite data, solved the doubts as to which one or more species of *Amomum* furnish the hot, acrid seeds now imported as *Guinea grains*. Similar doubts hang over the species or varieties of *Habzelia*, whose seeds were also known as *Guinea grains*, or *Ethiopian pepper*, and of *Cubeba*, supplying, according to Thonning, the *Ashantee pepper*."

That this work will pave the way for obtaining the requisite information on these and other important subjects connected with this highly interesting part of the globe we can entertain no doubt; and copies, we know, have been already sent out to some of the many intelligent natives of Africa, who have displayed a great desire for useful information.

Medical and Economical Botany; by JOHN LINDLEY, Ph.D., F.R.S., &c., *with numerous illustrations*. London, 1849.

This important volume is, a note tells us, "the concluding portion of the 'Elements of Botany,' the first two parts comprising Structural and Physiological Botany, and a Glossary of Technical Terms, being published in one octavo volume." And a welcome volume this assuredly is to every one who takes an interest in the uses to which vegetable substances are applied, in other words, the importance of the vegetable kingdom to mankind, particularly in a medical and economical point of view. It is not, however, now intended to be by any means complete as such. It seems rather destined to aid a botanical teacher or lecturer in his arduous duties. "The principal part of those [plants]," Dr. Lindley observes in the preface, "which can be brought by teachers in Europe under the notice of students, or which, from their great importance, deserve to be among the earliest

subjects of study, are mentioned in the following pages, where they are arranged in the manner proposed in the 'Vegetable Kingdom' of the author, with the sequence of matter departed from in a few instances, where it was believed that the convenience of younger students would be consulted by so doing. The author trusts that the selection will be found to have been made in such a way that all teachers who possess reasonably extensive means of illustrating their lectures, and all botanical gardens, may furnish the larger part of the species which are mentioned. A small selection was indispensable; firstly, because a greater work would have been beyond the reach of the majority of purchasers; and, secondly, because experience shows that those who have to study a science of observation, such as botany, require to concentrate the attention, in the first instance, upon a limited number of objects."

Agreeing, as we heartily do, in the above remarks, we cannot help wishing, that Dr. Lindley, with his varied acquirements and experience, would favour the world with a complete 'Economic Flora,' that is, as complete as the present state of our knowledge will admit. Such a work would be deeply interesting to every grade of mankind; and to the merchant and the manufacturer it could not fail to be a means of laying open new sources of industry and wealth to our country and to our colonies. Notices of our ignorance of the origin of many of our vegetable products would be the means of eliciting correct information; for such a book would, or ought to be, the *vade mecum* of every traveller who desires to benefit mankind by his researches.

The volume before us contains brief generic and specific characters, in English, of the plants, and excellent figures of a great number (363) of the species, the name of the country of which each is a native (the habitat), its qualities, and its uses. Dissections of the flowers and fruit are given in many cases, and the whole is rendered as popular as such a subject can be without detracting one iota from its scientific character.

CYBELE BRITANNICA; *or, the British Plants and their Geographical Relations; by* HEWETT COTTRELL WATSON. Vol. II. Distribution of Species (*continued*), LORANTHACEÆ to ALISMACEÆ. 8vo. London, 1849.

The first volume of this valuable and carefully-prepared work was

announced in our 'London Journal of Botany,' vol. vi. p. 200, and this, the second, brings us to the monocotyledonous plants. Such of this class "as still remain untreated of, together with the Filices and allied Orders, will form the earlier portion of the third volume. It is anticipated that the remainder of volume third will be required for supplementary and corrective additions to the two earlier volumes, likely to be supplied from the present rapidly accumulating stores of information on the subject of local botany in England."

"The author feels anxious to complete these three volumes, including all the phænogamous plants and ferns; because they will thus comprise a full collection of arranged data, ready for the use of any other botanical geographer, either in prosecuting similar researches, or in carrying them onward to more general views; and in order to render the three volumes as complete and useful as the plan of them may admit, in the light of a condensed arrangement of facts, it is earnestly recommended that competent botanists will either make public through the periodicals, or communicate to the author, any information which may tend to fill up deficiencies, to remedy defects, or to correct errors in either of the two volumes. The third volume, in which any such corrections, &c., can be made, will probably be prepared for the press in 1850 or 1851."

We trust that many active British botanists of the present day will respond to this call; for sure we are that their materials cannot be in better hands for such a publication than in those of Mr. Watson. The work is full of acute observation, bearing on the geographic relations of plants, and the author is equally keen at detecting the faults and errors of his brother botanists, and recording them too:—

> "Hae! land o' cakes and brither Scots,
> From Gretna Green to Johnie Groat's,
> If there's a hole in a' yer coats
>   I rede ye, *tent it*:
> A chiel's amang ye, taking notes,
> And, faith! he'll prent it."

British Flora.

A new edition (the 6th) of the 'British Flora' is preparing by Sir W. J. Hooker and Dr. Arnott, and will be ready by the spring of 1850.

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5.

Reeve, Benham & Reeve, imp.

Pl. VI

F. W. Mark Esq.r del.

Fitch del et lith.

R. B. & R. imp

Balsamodendron Mukul. *Stocks.*

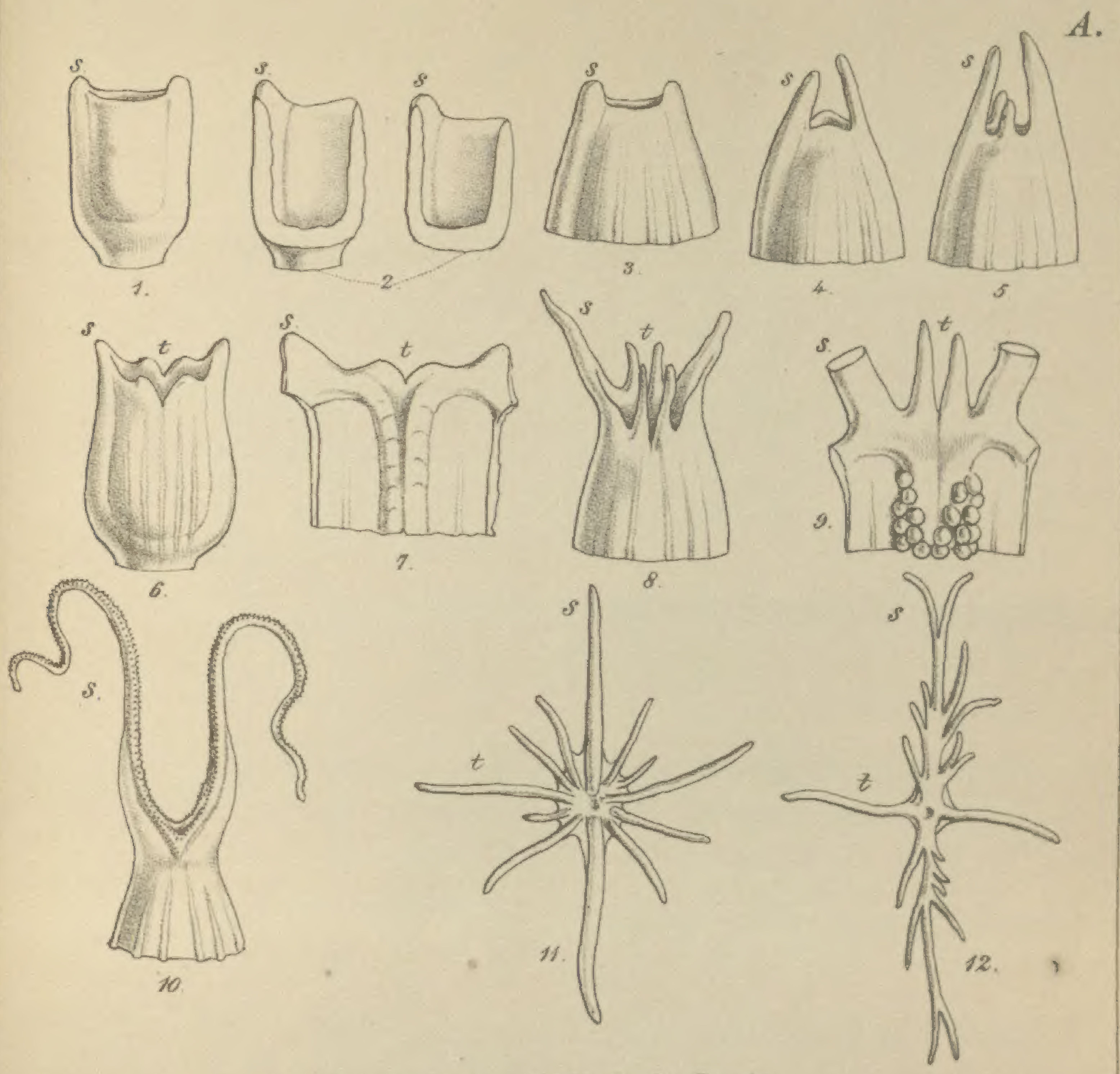
W. Abraham del[t]

R.B. & R. imp

Balsamodendron pubescens. *Stocks.*

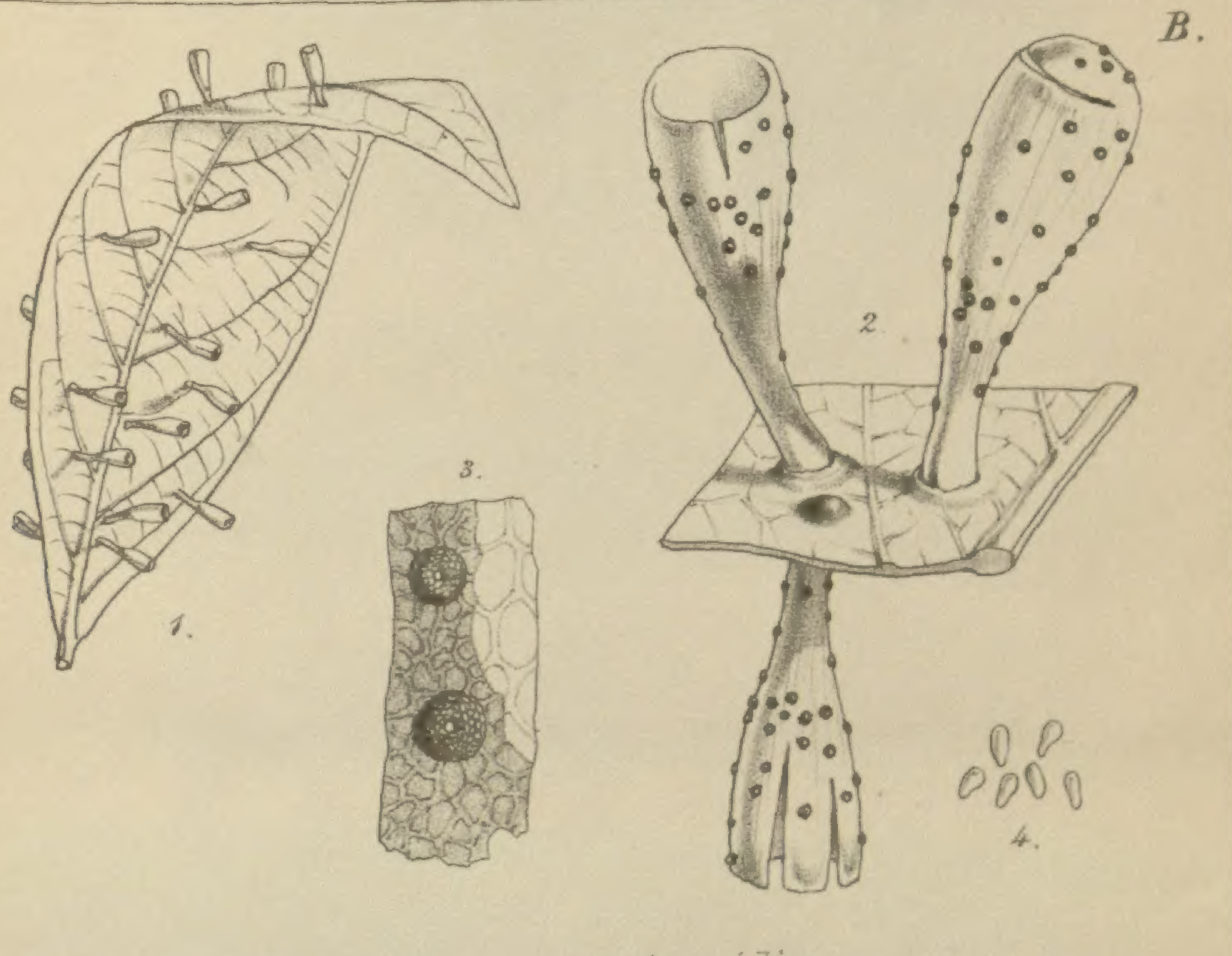
W. Abraham del[t]

R. B. & R. imp.



Stigmata of Eschsholtzia.

Rev. J.S.H.



Sphœronema epicecidium.

Fitch, lith.

R.B.&R. imp.

Fitch, del. et lith.

R. B. & R. imp.

Fitch lith.

R. B. & R. imp.